REPORT

GEOTECHNICAL INVESTIGATION

Holland Cross Expansion Ottawa

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Distribution List

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ATTACHMENTS

APPENDICES

1.0 INTRODUCTION

This report presents the results of a geotechnical and environmental assessment carried out at the Site of a proposed apartment building to be located at 1560 Scott Street in Ottawa, Ontario.

The purpose of this geo-environmental investigation was to assess the general subsurface conditions at the site by means of a limited number of boreholes. Based on an interpretation of the factual information obtained, a general description of the subsurface conditions is presented. These interpreted subsurface conditions and available project details were used to provide engineering guidelines on the geotechnical design aspects of the project, including construction considerations which could influence design decisions.

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 site of the proposed development is located at 1560 Scott Street in Ottawa, Ontario. A site plan is shown in Figure 1.

The Site has been previously developed and is currently occupied by a number of structures:

- The overall site measures about 140 m by 140 m in plan view and contains two 7 storey office buildings, one along the northern perimeter and one on the western perimeter, and 2 storey building in the southern part of the site. A single storey building covers most of the remainder of the site footprint.
- The proposed apartment building will be located in the southeast corner bordered to the north by Scott Street, to the west by Holland Avenue, to the south by multi-storey residential buildings and to the east by Hamilton Avenue.
- It is understood that a portion of the existing building will be demolished to allow for construction of the construction of the new building. The existing building to be demolished currently has two floors of underground parking.

It is understood that the proposed apartment building will consist of the following:

- The proposed building footprint is shown on the Site plan, Figure 1
- The proposed building will be approximately 25 storeys in height and encompass a plan area of about 34 m by 49 m.
- Similar to the existing structure at the site, the proposed structure will have two basement/below-grade levels. These basement levels will be completely contained within the footprint of the current building and will be at the same elevations. They will, therefore, not require any additional basement excavation.
- Additional details on finished floor slab levels were not available at the time of preparation of this report. It is, however, assumed that there would be no significant regrading of the site (given that the building will occupy one corner of an already extensively developed property).

2.1 Available Subsurface Information

Previous subsurface investigations at or near the site were carried out by Golder, and also by McRostie Genest Middlemiss and Associates (McRostie) who have since joined Golder. The locations of those previous boreholes/test pits are shown on the attached Site Plan (Figure 1). The following reports were reviewed in the assessment of site conditions for this study, which include the investigations for the existing development:

1) Report to Pomerleau by Golder titled "*Geotechnical Investigation Design Input, Holland Cross Expansion, 1560 Scott Street, Ottawa, Ontario*" dated May 2020 (Report No. 20141578).
2) Report to J.L. Richards & Associates Ltd. by Golder titled "*Geotechnical Investigation, Proposed Watermain and Sanitary Sewer Replacement, Holland Avenue, Scott Street to Tyndall Street, Ottawa, Ontario*" dated June 2012 (Report No. 11-1121-0281).
3) Letter to Laurnic Investments by McRostie titled "*Holland and Spencer Avenues, Beech Foundry Site, Rock Elevations*" dated June 6, 1984 (Report No. SF-2481).
4) Report to Citicom Inc., Brisbin Brooke Beynon, Architects and Carwood Leclair Inc. Consulting Engineers by McRostie titled "*Holland Cross Project, Holland Ave., Spencer St. & Scott St., Ottawa*" dated July 3, 1986 (Report No. SF-2687).

Based on the available information, the subsurface conditions are anticipated to consist surficial fill material overlying a thin veneer of glacial till, over bedrock. In general, the bedrock surface at the Site is expected to vary from about 0.5 to 2.8 m below the existing ground surface.

Published bedrock geology mapping indicates that the site is underlain by dolomite and limestone of the Bobcaygeon Formation.

3.0 PROCEDURE

The field work for the current geotechnical and environmental investigation was carried out between August 29 and August 30, 2022. During that time, three boreholes (numbered 22-01 to 21-03) were advanced at the approximate locations shown in the site plan in Figure 1.

The boreholes were advanced with a truck-mounted hollow stem auger drill rig supplied and operated by Marathon Underground. The boreholes were advanced to depths ranging from approximately 6 to 9 m below the existing ground surface.

All boreholes were advanced to refusal on the bedrock surface at depths ranging from 1.5 to 2.0 m. Upon encountering refusal, all three boreholes were advanced into the bedrock using rotary diamond drilling techniques while retrieving NQ sized core up to a depth of approximately 9 m at BH22-02B and BH 22-03; and approximately 6 m below ground surface at BH22-01.

Standard Penetration Tests (SPTs) were carried out within the overburden at various intervals of depth in general conformance with ASTM D 1586. Soil samples were recovered using split-spoon sampling equipment.

Monitoring wells were sealed into all boreholes to allow for subsequent measurements of stabilized groundwater levels. The monitoring wells consist of 32 mm inside diameter rigid PVC pipe with 3 m long slotted screen sections, installed within silica sand backfill, and sealed by a section of bentonite hole plug. Measurement of the groundwater levels was completed on October 3, 2022.

The fieldwork was supervised by Golder staff who logged the boreholes, directed the in-situ testing, and collected the soil and rock samples retrieved in the boreholes. The samples obtained during the fieldwork were brought to our laboratory for further examination and laboratory testing.

The laboratory testing included determination of natural water content and grain size distribution on selected soil samples, as well as Uniaxial Compressive Strength (UCS) testing on selected bedrock samples.

Shear wave velocity profiling at the site was completed using the Multichannel Analysis of Surface Waves (MASW) technique and was carried out on September 15, 2022 by Golder personnel. For the MASW line, a series of 24 low frequency (4.5 Hz) geophones were laid out at about 1 m intervals. An 8-kg sledgehammer and a 40-kg weight drop were used as the seismic sources. The source locations were offset at distances of about 5 and 10 m from and collinear with the geophone array.

The borehole locations were marked in the field and surveyed by Golder. The positions and ground surface elevations at the borehole locations were determined using a Trimble R8 GPS survey unit. The Geodetic reference system used for the survey is the North American Datum of 1983 (NAD83). The borehole coordinates are based on the Universal Transverse Mercator (UTM Zone 09) coordinate system. The elevations are referenced to the Geodetic datum (CGVD28).

4.0 SUBSURFACE CONDITIONS

4.1 General

The approximate locations of the boreholes and test pits previously advanced at the site are identified on Figure 1. Relevant borehole and test pit records from the previous investigations in the immediate vicinity of the proposed building are provided in Appendix B.

The following sections provide an overview of the subsurface conditions encountered. It should be noted that the previous investigations pre-dated development of the site and, as such, the near surface conditions are likely to have been altered by the existing development (e.g., removal of materials to permit construction of the existing below-grade structures, changes to the site grading) including significant bedrock excavations at the building locations.

In general, the subsurface conditions within the footprint of the proposed building consist of surficial thin fill layer, over a thin deposit of Glacial Till overlying limestone with thin shale interbeds. It should be noted that the current building is understood to have two floors of basement. Upon demolition, there will therefore also be an area in which the bedrock has been removed two storeys and the bedrock surface below the existing building will therefore be lower than encountered in the boreholes (which were drilled around the perimeter of the building).

4.2 Pavement Structure

A layer of asphaltic concrete, ranging from 100 to 150 mm thick, was encountered at BH22-02B and BH22-01 during the current investigation.

A 60 mm concrete block surface was present at BH22-03. The concrete block surface was overlying granular base/subbase material.

4.3 Surficial Fill Materials

A thin layer of fill material was present underlying the concrete slab, and the asphaltic concrete, within the proposed building footprint; the fill extended to depths of up to 1.37 m below the original ground surface within the footprint of the new development).

The previous geotechnical investigations carried out on this site indicate that the fill and/or organic materials were underlain by glacial till at or near the proposed building footprint. The glacial till consists of a heterogeneous mixture of gravel, cobbles, and boulders in a silty sand matrix.

As the proposed building footprint currently contains two below grade levels, it is anticipated that the above noted materials were removed (within the footprint of the building) during construction of the existing building.

4.4 Glacial Till

A layer of Glacial Till (Silty Sand to Sandy Gravel) was encountered in all boreholes ranging from about 0.76 m to 1.52 m.

The Till layer is brown to grey in colour, with measured SPT “N” values ranging from 27 to greater than 55 blows per 0.3 m of penetration, indicating a compact to very dense state of compaction.

4.5 Bedrock / refusal

Refusal to augering was encountered in all boreholes during the current investigation at depths ranging from 1.5 to 2.0 m below the existing ground surface. The bedrock was cored in all of the current boreholes to a maximum depth of 9 m below the existing ground surface. The following table summarizes the ground surface, bedrock or auger refusal depths and elevations, and core lengths as encountered at the borehole locations within (or near to) the footprint of the proposed building:

Borehole/ Test Pit Number	Ground Surface Elevation (m)	Depth to Bedrock Surface or Auger Refusal (m)	Core Length (m)	Bedrock or Auger Refusal Elevation (m)
22-01 (Golder, 2022)	61.60	1.60	4.67	60.00
22-02B (Golder 2022)	61.72	1.85	7.15	59.87
22-03 (Golder 2022)	60.16	1.52	7.00	59.68
TP11 (Mcrostie,1984)	62.48	1.34	-	60.77
N150 E120 (Mcrostie,1986)	61.50	1.60	-	59.95
N120 E120 (Mcrostie,1986)	62.24	2.45	-	59.79
N180 E110 (Mcrostie,1986)	62.06	2.30	-	59.76

The bedrock encountered in the cored boreholes typically consists of limestone with interbedded shale.

Rock Quality Designation (RQD) values measured in the boreholes ranges from 46 to 96%, indicating a poor to excellent quality rock.

The results of laboratory testing carried out on two samples of the cored bedrock from 22-02B and 22-03 measured Uniaxial Compressive Strengths (UCS) of about 169 and 118 MPa, respectively, indicating the samples of the rock tested are strong to very strong. Photographs of the recovered bedrock cores and results of the UCS testing are presented in Appendix G.

4.6 Groundwater conditions

Monitoring wells were sealed in three boreholes (22-01, 22-02B and 22-03) to allow for groundwater level measurements and hydraulic conductivity testing. The groundwater levels were measured on October 3, 2022. Hydraulic conductivity testing was completed on October 3, 2022. The results of the hydraulic conductivity analyses are provided in Appendix F. The measured groundwater levels and hydraulic conductivity testing results are presented in the table below.

Borehole/Test Pit Number	Geological unit of screened Interval	Ground Surface Elevation (m)	Ground Water Depth (m)		Measurement Dates	Hydraulic Conductivity (cm/s)
			Depth (m)	Elevation (m)		
22-01 (Golder, 2022)	Bedrock	61.60	3.83	57.77	Oct. 3, 2022	$2x10^{-6}$
22-02B (Golder 2022)	Bedrock	61.72	4.88	56.84	Oct. 3, 2022	$3x10^{-4}$
22-03 (Golder 2022)	Bedrock	61.68	5.43	56.25	Oct. 3, 2022	$5x10^{-3}$

Groundwater levels are expected to fluctuate seasonally and over shorter periods of time. Higher groundwater levels are expected during wet periods of the year, such as spring after the snowmelt or during periods of heavy rain. The water table elevation at the site may decrease in localized areas after development depending on the elevation of the building drains and linear infrastructure.

5.0 GEOPHYSICAL INVESTIGATION

Golder completed a Multichannel Analysis of Surface Waves (MASW) survey to estimate the shear velocity at the proposed development. The result of this investigation is presented in appendix D.

6.0 DISCUSSION AND GEOTECHNICAL RECOMMANDATION

6.1 General

This section of the report provides engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the available information described herein and project requirements.

The information in this portion of the report is provided for planning and design purposes for the guidance of the design engineers and architects. The recommendations provided herein are consistent with the Ontario Building Code of 2012 (OBC 2012). Where comments are made on construction, they are provided only to highlight aspects of construction which could affect the design of the project. Contractors bidding on or undertaking the 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, costs, sequencing and the like.

6.2 Foundation Design

It is understood that the proposed building will have two basement levels (at similar elevations to the existing basement levels). The proposed development will therefore not require bulk excavation. Minor, localized excavation may be required to accommodate footing construction.

The bedrock surface is at about 1.34 to 2.45 metres depth below the existing ground surface (i.e., elevations ranging from 61.1 to 59.7 metres). The proposed structure is planned to have two underground parking levels. As such, the excavation for the building tower is expected to extend to depths of about 7 to 9 metres below existing site grades. At these levels, new building foundations are expected to be founded within limestone bedrock (provided they are at or below the elevation of the existing basement excavation).

It is expected the tower could be supported on pad, strip or raft foundations placed on the bedrock at the base of the basement excavation. Foundations supported directly on the bedrock may be designed using a factored Ultimate Limit States bearing resistance of 6 MPa. Provided the bedrock surface is properly cleaned of soil and loose rock at the time of construction, the settlement of footings sized using this factored bearing resistance should be less than the 25 mm which is typically accepted and therefore Serviceability Limit States (SLS) typically do not govern the design of shallow foundations on rock.

Foundations should be entirely supported on rock. If the existing rock surface is below the planned footing level at the time of construction (for example where a previous excavation was present), mass concrete should be placed to bring the surface up to the planned underside of footing. Mass concrete, if used, should extend beyond the edge of the footing a distance equal to the depth of the mass concrete.

6.3 Seismic Design

Based on the results of the Multichannel Analysis of Surface Waves (MASW) testing carried out at this site, this site can be assigned a Site Class of **B** for seismic design purposes in accordance with the 2012 OBC for all structures founded on rock.

6.4 Excavations

Details on the finished floor elevations for the proposed building were not available at the time of preparation of this report. However, it is understood that the proposed building will be constructed within a portion of the existing building footprint which contains two below-grade levels, and which will be demolished prior to construction of the new building. The proposed building will incorporate two below-grade levels. As the proposed and existing buildings both have two underground levels, it is anticipated that excavations will be limited primarily to small, localized excavations in new footing areas, utility trenches, etc. These localized foundation excavations are therefore expected to be within limestone bedrock. Shallow excavations may also be required outside the building for utility trenches and other buried works.

In general, the subsurface conditions on this site consisted of topsoil and fill overlying glacial till, with the bedrock surface located at depths varying from about 1.6 to 2.5 m below the ground surface at the time of the previous investigations. In accordance with the Occupational Health and Safety Act (OHSA) of Ontario, the soils above the water table at this site would generally be classified as Type 3 soils and side slopes in the overburden *above the water table* may therefore be sloped at a minimum of 1H:1V. However, in accordance with the OHSA of Ontario, the soils below the water table would generally be classified as Type 4 soils, and excavation side slopes must be sloped at a minimum of 3H:1V if dewatering of these materials is not carried out. This condition is not, however, anticipated to exist based on the current information.

Depending on the final excavation geometry (i.e., if sloped excavations cannot be accommodated), some shoring/temporary support may be needed for the excavation in overburden adjacent to the loading dock facility located immediately north of the proposed building and/or adjacent to Hamilton Avenue to prevent undermining of the roadways.

It is expected that near vertical walls may be developed in the bedrock for the shallow excavations needed for new footing construction in the floor of the existing basement. Similarly, if/where the existing foundation walls are removed; leaving the existing vertical bedrock excavation walls in place is anticipated to be feasible.

However, the exposed bedrock should be inspected by qualified geotechnical personnel at the time of excavation to confirm this assessment. It is also possible that previous blasting has damaged/loosened the existing rock faces and localized rock stabilization (such as rock bolting, shotcreting, installation of rock fall mesh, etc.) may be required if areas of poor rock are exposed in the excavation.

Shallow depths of bedrock removal for this project, such as those required for localized excavations for footings, could be accomplished using mechanical methods (such as hoe ramming in conjunction with line drilling). Care will need to be taken to protect the adjacent structures/foundations from damage during bedrock excavation. It is expected/assumed that blasting will not be required.

It is assumed that there is an existing drainage system below the existing building floor slab which has lowered the groundwater level to below the base of the existing building. Provided that the bulk excavation for the new building does not extend substantially below the current below-grade building levels, groundwater inflow into the foundation excavations can probably be handled by pumping from properly constructed and filtered sumps located within the excavations.

6.4.1 Bedrock Excavation

It is likely that the localized bedrock removal will be carried out using drill and blast techniques or mechanical methods (such as hoe ramming or hydraulic jacks) in conjunction with line drilling. Small, shallow excavations in bedrock are typically carried out mechanically, while larger, deeper excavations are typically more economical using blasting.

If blasting is considered, blast induced damage to the bedrock must be avoided in the vicinity of existing structures (including buried structures such as the utilities), otherwise additional rock reinforcement could be required. At the final rock line, the bedrock should be line drilled at a close spacing in advance of blasting so that a clean bedrock face can be formed. It is considered that 75 mm diameter holes at a spacing of 200 mm or less would be appropriate for this purpose.

Based on the quality of the bedrock encountered in the boreholes, it is expected that existing near vertical bedrock walls around the existing basement can likely be maintained for the construction period provided that any loose pieces of the bedrock are scaled off the faces for worker safety. Where the localized new excavations extends deeper than 1.8 m into the bedrock, the near vertical walls should be reviewed by a geotechnical engineer for any sign of unstable pillars or slabs that should be removed or stabilized. Stabilization options could consist of rock anchors, mesh, shotcrete, sloping the side slopes or a combination thereof. The appropriate stabilization methodology, if required, will depend on the actual site conditions during construction, and further guidance can be provided at that time.

Where excavations are immediately adjacent to (and below) existing foundations the excavation designer must consider the potential for movement of the excavation walls and potential impacts to existing structures.

Vibration monitoring should be carried out as outlined in Section 6.4.2.

6.4.2 Vibration Monitoring

Due to the close proximity of the existing surrounding structures to the proposed development, construction vibration, (particularly when blasting, breaking rock, driving piles or carrying out other similar vibration intensive works) should be controlled to limit the peak particle velocities at all adjacent structures or services such that vibration induced damage will be avoided.

A pre-construction survey is recommended to be carried out on all nearby structures and services. Any area of concerns should be identified during the pre-construction survey and should be monitored for movements during construction.

If blasting is required, the contractor should be required to submit a complete and detailed blasting design, as well as a monitoring plan prepared by a blasting/vibration specialist before starting blasting. This should be reviewed and accepted in relation to the requirements of the blasting specifications.The contractor should be limited to only small, controlled moves. Peak vibration limits dependent on the following frequencies to the nearest structures and services are suggested.

The following frequency dependent peak vibration limits at the nearest structures and services are typical, but it is suggested they be confirmed by the structural engineer for the particular structure.

Frequency Range (Hz)	Vibration Limits (mm/s)
< 10	5
10 to 40	5 to 50 (sliding scale)
> 40	50

These limits should be practical and achievable on this project. Blasting will likely generate vibrations greater than 40 Hz at the nearest structures. The majority of structures and their components have natural frequencies in the range of 4 to 24 Hz.

These limits are based on reducing the risk of structural damage. These vibration limits will need to be adjusted if there is vibration-sensitive equipment in the vicinity of the new building. Guidelines can be provided; however, it is preferable for equipment manufacturers to provide these limits.

It is recommended that the monitoring of ground vibration intensities (peak ground vibrations and accelerations) from the construction activities (e.g., blasting) be carried out both in the ground adjacent to the closest structures and within or at the structures themselves.

6.5 Groundwater Control

It is understood that two levels of underground garage parking are being considered, which will be located within the footprint of the existing basement. These two levels are assumed to extend about 6.0 m below the existing ground surface (i.e., base elevation of 56.6 m). Accordingly, excavation to these depths will be through surficial fill and sand, into the underlying bedrock in areas outside the footprint of the existing building and parking garage (to be demolished). Based on the groundwater conditions observed in the monitoring wells, excavations will extend below the groundwater level. The rate of groundwater inflow to the excavation will depend on many factors, including: the details of the existing excavation, the exact size of the excavation, and the time of year at which the excavation is made. Also, there may be instances where precipitation collects in an open excavation and must be rapidly pumped out.

According to O.Reg. 63/16 and O.Reg. 387/04, if the volume of water to be pumped from excavations for the purpose of construction dewatering is greater than 50,000 L/day and less than 400,000 L/day, the water taking will need to be registered as a prescribed activity in the Environmental Activity and Sector Registry (EASR) and has several requirements including the completion of a “Water Taking Plan”. Alternatively, a Permit to Take Water (PTTW) is required from the Ministry of the Environment Conservation and Parks (MECP) if a volume of water greater than 400,000 L/day is to be pumped from an excavation.

It is possible that groundwater elevations encountered during construction may be higher than those observed in October 2022, if, for example, construction occurs during the spring. Therefore, groundwater inflow estimates were completed using a groundwater elevation that is 0.5 m higher than the measured groundwater elevations. Incident precipitation could add approximately 132,000 L/day to the underground parking excavation, assuming a footprint of 1,666 m^2, and assuming a 79.2 mm precipitation event (a 10-year event as observed at the Ottawa Airport weather station).

The Dupuit-Forcheimer analytical solution was used to estimate the potential groundwater inflow into the underground parking excavation using the average hydraulic conductivity measured in the wells. The initial head elevation of the analytical model was assigned a value of 58.3 m (i.e., 0.5 m above the value recorded at monitoring well 22-01). It is assumed that construction dewatering activities would lower the groundwater level to an elevation of 56.1 m (i.e., 0.5 m below the bottom of the excavation). The average bedrock hydraulic conductivity estimated at the monitoring wells was approximately 2×10^{-3} cm/s. The amount of dewatering needed for the excavation is estimated to be between 118,000 (steady-state inflow) and 804,000 (initial inflow) litres per day (L/day). The radius of influence for the excavation is estimated to be approximately 30 m from the edge of the excavation. Groundwater inflow and dewatering radius of influence calculations are included in Appendix E.

Based on the groundwater conditions observed at the site and depending on how the excavation proceeds, water taking exceeding 400,000 L/day may be initially required to dewater groundwater from the excavation. However, with careful management of groundwater pumping rates during the initial stages of opening excavations, it may be possible to keep water taking rates below 400,000 L/day. As a result, the proposed work could be carried out under an EASR registration.

Information regarding the discharge of pumped groundwater is provided in the Phase II ESA report for this project, which is provided under separate cover.

6.6 Frost Protection

All perimeter and exterior foundation elements or interior foundation elements in unheated areas should be provided with a minimum of 1.5 m of earth cover for frost protection purposes. Isolated, unheated exterior footings adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum of 1.8 m of earth cover.

It is expected that these requirements will be satisfied for all of the structure footings due to the deep founding levels required to accommodate the below-grade parking.

6.7 Basement Floor/Raft Slab

In preparation for the construction of the basement floor slab, all loose, wet, and disturbed material should be removed from beneath the floor slab. The feasibility of reusing existing underslab granular fill materials can also be evaluated.

Provision should be made for at least 300 mm of 16 mm clear crushed stone to form the base of the floor slab. To prevent hydrostatic pressure build up beneath the floor slab, it is suggested that the granular base for the floor slab be drained. This should be achieved by installing geotextile-wrapped, rigid 100 mm diameter perforated pipes in the floor slab bedding at 6 m centres. The perforated pipes should discharge to a positive outlet such as a storm sewer or a sump from which the water is pumped.

If an asphalt surface will be provided for the basement level, a thickness of at least 150 mm of OPSS Granular A base materials should be provided above the clear stone. The Granular A should be compacted to at least 100% of the material’s Standard Proctor Maximum Dry Density (SPMDD).

6.8 Basement Walls

The backfill and drainage requirements for basement walls, as well as the lateral earth pressures will depend on the exact details of the existing excavation and the new basement structure.

The following sections assume that water-tight construction will not be required. If it is determined that water-tight construction is needed, additional design guidelines will be required.

6.8.1 Open Cut Excavations

The soils at this site are frost susceptible and should not be used as backfill against exterior, unheated, or well insulated foundation elements within the depth of potential frost penetration (1.5 m) to avoid problems with frost adhesion and heaving. Free draining backfill materials are also required if hydrostatic water pressure against the basement walls (and potential leakage) is to be avoided. The foundation and basement walls therefore should be backfilled with non-frost susceptible sand or sand and gravel conforming to the requirements for OPSS Granular B Type I.

To avoid ground settlements around the basement walls which could affect site grading and drainage, all of the backfill materials should be placed in 0.3 m thick lifts and compacted to at least 95% of the material’s SPMDD.

The basement wall backfill should be drained by means of a perforated pipe subdrain in a surround of 19 mm clear stone, fully wrapped in a geotextile, which leads by positive drainage to a storm sewer or to a sump from which the water is pumped.

6.9 Lateral Earth Pressure for Design

It is considered that two possible design conditions could exist with regards to the lateral earth pressures that will be exerted on the basement walls:

1) Walls cast directly against the bedrock face or walls cast against formwork with a narrow, backfilled gallery provided between the basement wall and the adjacent excavation bedrock face.

2) Walls cast against formwork with a wide backfilled gallery provided between the basement wall and the adjacent excavation face.

For Case 1, the magnitude of the lateral earth pressure depends on the magnitude of the arching which can develop in the backfill and therefore depends on the width of the backfill, its angle of internal friction, as well as the interface friction angles between the backfill and both the rock face and the basement wall. The magnitude of the lateral earth pressure can be calculated as:

$$\sigma_h(z) = \frac{\gamma B}{2\tan\delta}\left(1 - e^{-2K\frac{z}{B}\tan\delta}\right) + K\,q$$

Where: $\sigma_h(z)$ = Lateral earth pressure on the basement wall at depth z, in kPa;

K = Earth pressure coefficient, use 0.6;

γ = Unit weight of retained soil, use 20 kN/m^3 for clear stone chip;

B = Width of backfill (between basement wall and bedrock face), m;

δ = Average interface friction angle at backfill-basement wall and backfill-rock face interfaces, use 15°;

z = Depth below top of formwork, m; and,

q = Uniform surcharge at ground surface to account for traffic, equipment, or stock piled materials (use 15 kPa).

For Case 2, the basement walls should be designed to resist lateral earth pressures calculated as:

$$\sigma_h(z) = K_o\,(\gamma z + q)$$

Where: $\sigma_h(z)$ = Lateral earth pressure on the wall at depth z, in kPa;

K_o = At-rest earth pressure coefficient, use 0.5;

γ = Unit weight of retained soil, use 22 kN/m^3;

z = Depth below top of wall, m; and,

Conventional damp proofing of the basement walls is appropriate with the above design approach. For concrete walls poured against shoring or bedrock, damp proofing using a crystalline barrier such as Crystal Lok, Xypex or equivalent could be used. The use of a concrete additive that provides reduced permeability could also be considered.

For all cases, hydrostatic groundwater pressures would also need to be considered if the structure is designed to be water-tight.

The lateral earth pressures acting on the below-grade walls as a result of seismic events will be highly dependent on the backfill types and methods. For Case 2, the lateral earth pressures noted above would increase under seismic loading conditions. The earthquake-induced dynamic pressure distribution, which is to be added to the static earth pressure distribution, is a linear distribution with maximum pressure at the top of the wall and minimum pressure at its toe (i.e., an inverted triangular pressure distribution).

The combined pressure distribution (static plus seismic) may be determined as follows:

$$\sigma_h(z) = K_o\,\gamma\,z + (K_{AE} - K_A)\,\gamma\,(H\text{-}z)\text{; non-yielding walls}$$

Where: K_{AE} = The seismic earth pressure coefficient, use 0.42;

K_a = The static active earth pressure coefficient

H = The total depth to the bottom of the foundation wall (m).

For the other backfill design conditions, design lateral pressures resulting from seismic loading should be assessed during the next design stage once further details on building and backfill configuration are available.

Hydrodynamic groundwater pressures would also need to be considered if the structure is designed to be water-tight. However, more sophisticated analyses may need to be carried out at the detailed design stage.

All of the lateral earth pressure equations are given in an unfactored format and will need to be factored for Limit States Design purposes.

It has been assumed that the underground parking levels will be maintained at minimum temperatures but will not be permitted to freeze. If these areas are to be unheated, additional guidelines for the design of the basement walls and foundations will be required.

In areas where pavement or other hard surfacing will abut the building, differential frost heaving could occur between the granular fill immediately adjacent to the building and the more frost susceptible backfill placed beyond the wall backfill. To reduce the severity of this differential heaving, the backfill adjacent to the wall should be placed to form a frost taper. The frost taper should be brought up to pavement subgrade level from 1.5 m below finished exterior grade at a slope of 3 horizontal to 1 vertical, or flatter, away from the wall. The granular fill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95 percent of the material’s SPMDD using suitable vibratory compaction equipment.

6.10 Site Servicing

At least 150 millimetres of OPSS Granular A should be used as pipe bedding for sewer and water pipes. Where unavoidable disturbance to the subgrade surface occurs during construction, it may be necessary to place a sub-bedding layer consisting of 300 millimetres of compacted OPSS Granular B Type II beneath the Granular A. The bedding material should, in all cases, extend to the spring line of the pipe and should be compacted to at least 95 percent of the material’s standard Proctor maximum dry density. The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from the sandy backfill materials and native soils could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support.

Cover material, from the spring line of the pipe to at least 300 millimetres above the top of pipe, should consist of OPSS Granular A or Granular B Type I with a maximum particle size of 25 millimetres. The cover material should be compacted to at least 95% of the material’s SPMDD.

It should generally be possible to re-use the existing inorganic fill, weathered silty clay, sands and glacial till as trench backfill. Where the trench will be covered with hard surfaced areas, the type of material placed in the frost zone (between subgrade level and 1.8 metres depth) should match the soil exposed on the trench walls for frost heave compatibility. Trench backfill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95% of the material’s SPMDD using suitable vibratory compaction equipment.

7.0 PAVEMENT DESIGN

It is understood new parking lots and access roadway will be constructed as part of the development.

In preparation for pavement construction, all topsoil, unsuitable fill, disturbed, or otherwise deleterious materials (i.e., those materials containing organic material) should be removed from the pavement areas. Some of the existing fill could remain provided that it is free of organic matter, and that the subgrade be subjected to a proof roll with a loaded tandem truck to reveal weak or soft areas prior to the construction of the new pavement structure. Soft or weak areas should be removed and repaired with acceptable earth borrow or OPSS Select Subgrade Material (SSM).

Sections requiring grade raising to the proposed subgrade level should be filled using acceptable (compactable and inorganic) earth borrow (OPSS.MUNI 206/212), Select Subgrade Material (OPSS.MUNI 1010) or additional granular base if grade changes are minor. These materials should be placed in maximum 300 mm thick lifts and should be compacted to at least 98% of the materials SPMDD using suitable compaction equipment.

The surface of the subgrade or fill should be crowned or sloped to promote drainage of the roadway granular structure. Perforated pipe subdrains should be provided along the low sides of the roadway along the entire length. The subdrains should be installed in accordance with OPSS.MUNI 405. The subdrains should be connected to the catch basins such that the pavement structure will be positively drained and will intercept flows within the subbase.

Below the pavement structure, frost compatibility must be maintained across any new service trenches. Due to the variability of the soils within the project limits, the subsoil should be inspected by qualified geotechnical personnel to make sure that there is no potential for differential frost heaving. Frost tapers from the bottom of granular subbase to 1.8 m depth should be constructed at 10H:1V and should be provided where necessary.

The pavement recommendations have been split up into two categories of light duty and heavy-duty pavements. It has been assumed the light duty areas will consist of parking areas and lighter vehicles (i.e., no truck or bus traffic), and the heavy-duty pavements will consist of occasional truck traffic. The pavement in each area should be constructed as follows:

Material		Thickness of Pavement Elements (mm)	
		Light Duty	Heavy Duty
Asphaltic Concrete OPSS.MUNI 1151	Superpave 12.5 mm	40	50
	Superpave 19.0 mm	50	70
Granular Material OPSS.MUNI 1010	Granular A Base	150	150
	Granular B, Type II Subbase	400	500

The above pavement design is based on the assumption that the pavement subgrade has been acceptably prepared (i.e., where the bottom of the excavation has been adequately compacted to the required density and the subgrade surface is not disturbed by construction operations or precipitation). Depending on the actual conditions of the pavement subgrade at the time of construction, it could be necessary to increase the thickness of the subbase. Additionally, a Class II woven geotextile conforming to OPSS 1860 should be provided under pavement areas to prevent pumping of the subgrade into the Granular B Type II subbase.

8.0 IMPACT ON ADJACENTS DEVELOPMENTS

Possible impacts on adjacent developments could result from:

- Ground movement around the perimeter of new excavations.
- Ground settlements due to the planned temporary and permanent groundwater level lowering, if sensitive and compressible clay soils exist within the expected zone of influence of the groundwater level lowering (which, as discussed below, it not the case for this development).

A preconstruction survey of all structures located within close proximity to this site should be carried out prior to commencement of the excavation.

The structures that are mostly at risk of being impacted by ground movements associated with construction of the new building are the portions of the existing structure that are located immediately adjacent to the new structure (e.g., the parkade structure ramps to the south and the single storey building located in the central portion of the site). It is understood that these structures also contain two below-grade levels and are anticipated to be supported on spread footings on bedrock.

As a general guideline for excavation planning, unsupported excavations for the new structure should not come within 0.5 m of the edge of the footings of the existing buildings. To avoid undermining of the rock and/or disturbance of the rock, careful line drilling of the excavation limits in this area must be undertaken.

Given the relatively shallow depth of additional bedrock excavation, no rock reinforcement is anticipated to be required for this excavation. However, the exposed bedrock should be inspected by qualified geotechnical personnel at the time of excavation to confirm that assessment particularly in areas where excavations will be developed in close proximity to existing foundations.

9.0 ADDITIONAL CONSIDERATIONS

At the time of writing this report, only conceptual details related to the proposed building were available. Golder Associates should review the final drawings and specifications for this project prior to tendering to confirm that the guidelines in this report have been adequately interpreted.

During construction, sufficient foundation inspections, subgrade inspections, in-situ density tests, materials testing, pile and rock anchor installation monitoring should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications. Concrete testing should be carried out in a CCIL certified laboratory.

All bearing surfaces must be inspected by Golder prior to filling or concreting to ensure that strata having adequate bearing capacity have been reached and that the bearing surfaces have been properly prepared.

10.0 CLOSURE

We trust that this report provides sufficient geotechnical engineering information to facilitate the design of this project. If you have any questions regarding the contents of this report or require additional information, please do not hesitate to contact this office.

Signature Page

Golder Associates Ltd.

LICENSED PROFESSIONAL ENGINEER
C. G. HENDRY
100011328
Nov. 3, 2022
PROVINCE OF ONTARIO

Arthur Kuitchoua Petke, ing.
Geotechnical Engineer

Chris Hendry, P.Eng
Senior Geotechnical Engineer

AKP/CH/ljv

https://golderassociates.sharepoint.com/sites/164073/project files/6 deliverables/geotech/final nov 2022/22530229 rpt rev0 2022'11'03 - holland cross expansion.docx

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

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

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

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

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

Soil, Rock and 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.

IMPORTANT INFORMATION AND LIMITATIONS
OF THIS REPORT (cont'd)

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.

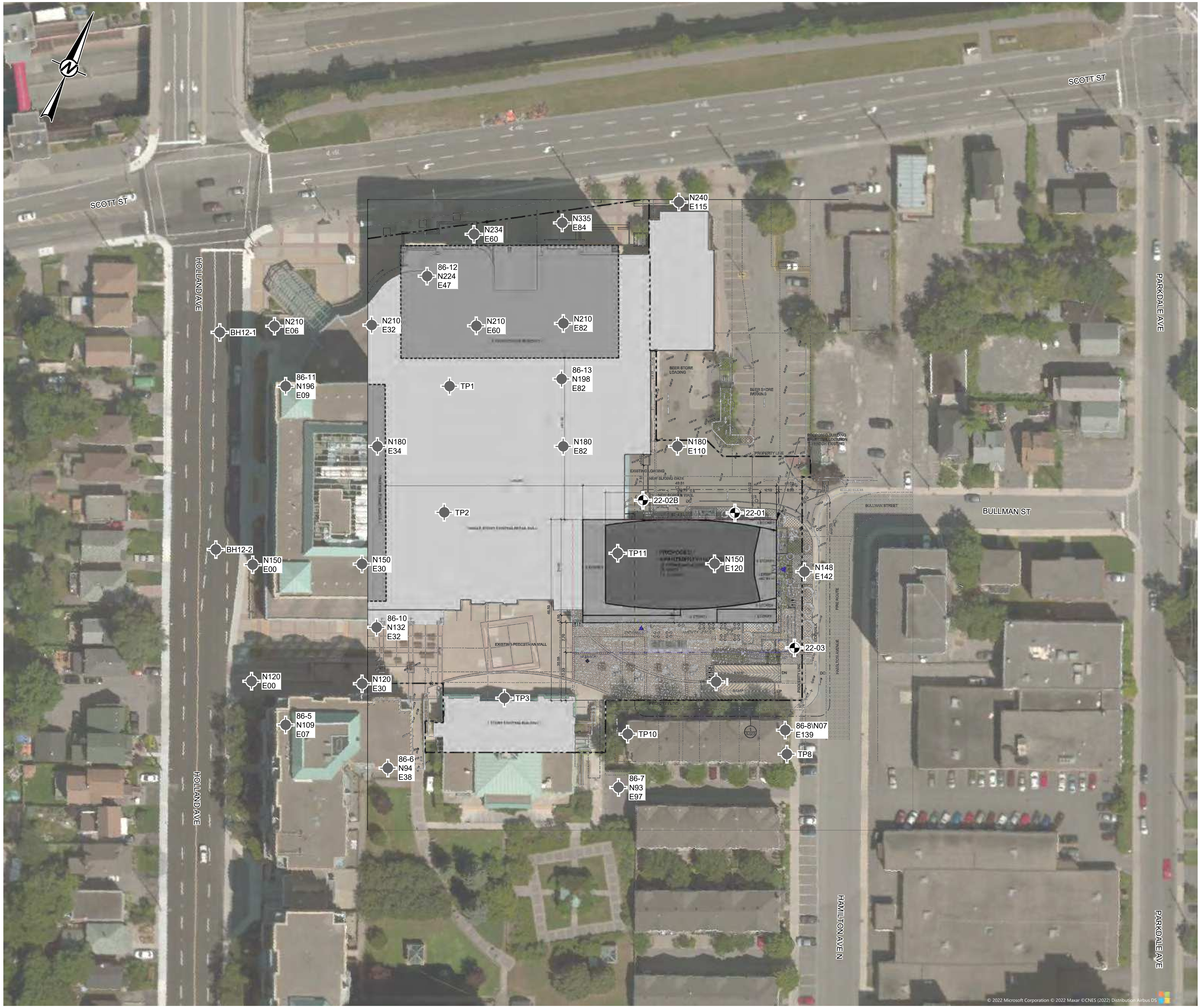
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater 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.



KEY MAP

SCALE: 1:50,000 m

LEGEND

⊕	BOREHOLE LOCATION, CURRENT INVESTIGATION
●	BOREHOLE LOCATION, PREVIOUS INVESTIGATIONS

REFERENCE(S)

1. PROJECTION: TRANSVERSE MERCATOR, DATUM NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM CGVD28

0 25 50
1:1,000 METRES

CLIENT
STANTEC

PROJECT
GEOTECHNICAL INVESTIGATION HOLLAND CROSS EXPANSION BUILDING

1560 SCOTT STREET, OTTAWA, ONTARIO
SITE PLAN

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-09-30
DESIGNED	----
PREPARED	ZS
REVIEWED	AKP
APPROVED	CH

PROJECT NO.	CONTROL	REV.	FIGURE
22530229	0002	0	1

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

APPENDIX A

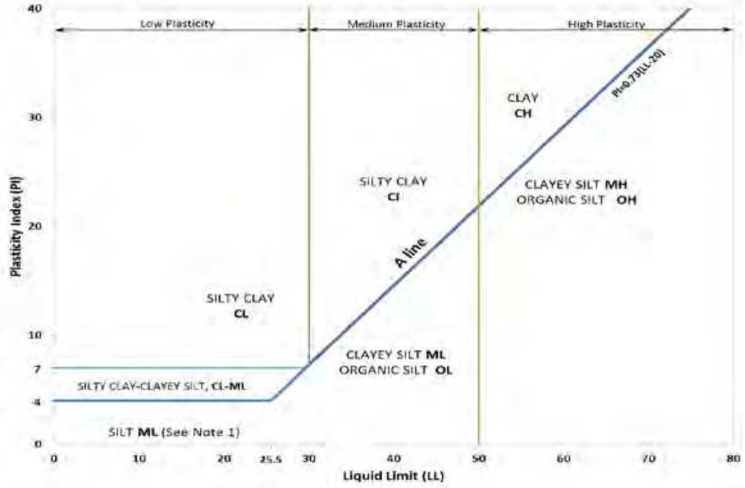
Borehole Records – Current Investigation (GOLDER/WSP)

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	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10}xD_{60}}$	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
σ_1, σ_2, σ_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

(a) Index Properties (continued)

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)

(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 $= \sigma'_p / \sigma'_{vo}$

(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

---

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

PROJECT: 22530229 (3000)
LOCATION: N 442688.50; E 5028045.00

RECORD OF BOREHOLE: BH22-01

BORING DATE: August 29, 2022

SHEET 1 OF 2
DATUM: Geodetic

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

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE – DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		61.60							
0		ASPHALTIC CONCRETE (100 mm)	■	0.00							Concrete
		FILL - (SM) SILTY SAND, some gravel, contain rock fragments; dark brown; non-cohesive, moist	▩	0.10	1	GS					
1		(GP) GRAVEL, some sand; grey (TILL); non-cohesive, dry, compact to very dense		60.84 0.76	2	SS	27				Bentonite
		Weathered bedrock, possible cobbles and boulders		60.23 1.37	3	SS	55				
		END OF BOREHOLE/DRILLHOLE		60.00 1.60							

Notes:

1. Auger refusal.

DEPTH SCALE
1 : 50

LOGGED: PK
CHECKED: AKP

PROJECT: 22530229 (3000)

RECORD OF DRILLHOLE: BH22-01

SHEET 2 OF 2

LOCATION: N 442688.5 ;E 5028045.0

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE:

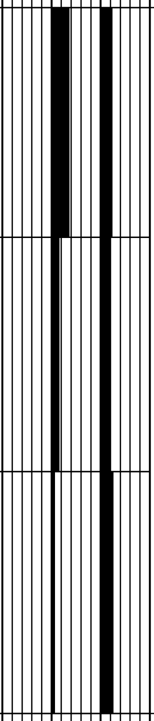
DRILL RIG:

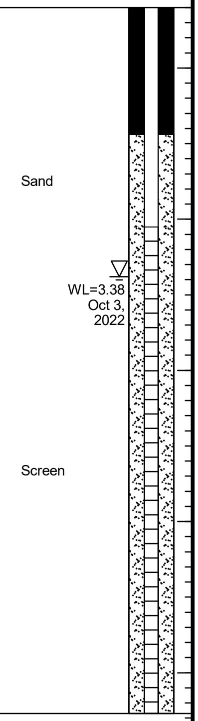
DRILLING CONTRACTOR: Marathon Drilling

DATUM: Geodetic

JN - Joint	BD- Bedding	PL - Planar	PO- Polished	BR - Broken Rock
FLT - Fault	FO- Foliation	CU- Curved	K - Slickensided	**NOTE:** For additional abbreviations refer to list of abbreviations & symbols.
SHR- Shear	CO- Contact	UN- Undulating	SM- Smooth	
VN - Vein	OR- Orthogonal	ST - Stepped	Ro - Rough	
CJ - Conjugate	CL - Cleavage	IR - Irregular	MB- Mechanical Break	

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH COLOUR % RETURN	RECOVERY TOTAL CORE % 80 60 40 20	RECOVERY SOLID CORE % 80 60 40 20	R.Q.D. % 80 60 40 20	FRACT. INDEX PER 0.25 m 5 10 15 20	DISCONTINUITY DATA B Angle 0 90 180 270	DISCONTINUITY DATA DIP w.r.t. CORE AXIS 0 30 60 90	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec 10^{-6} 10^{-5} 10^{-4} 10^{-3}	Diametral Point Load Index (MPa) 2 4 6	RMC -Q' AVG.
		Continued from Record of Borehole 22-01		60.00															
2 3 4 5 6	HQ-Coring	Fresh fine-medium grained, slightly porous to non-porous, grey LIMESTONE bedrock with thin Shale interbeds		1.60 55.33 6.27	1 2 3														
7																			
8																			
9																			
10																			
11																			





DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: PK

CHECKED: AKP

PROJECT: 22530229 (3000)
LOCATION: N 442665.40; E 5028039.00

RECORD OF BOREHOLE: BH22-02B

BORING DATE: August 29, 2022

SHEET 1 OF 2
DATUM: Geodetic

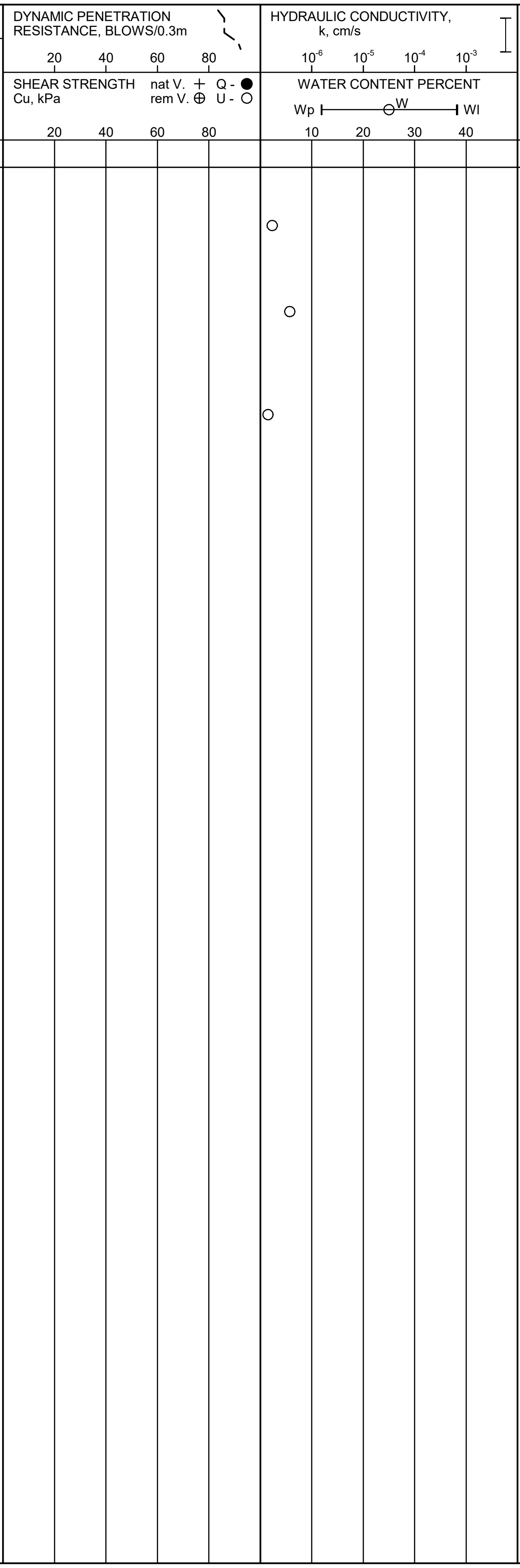
SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	61.72				
0		ASPHALTIC CONCRETE (150 mm)	0.00				Concrete
		FILL - (SM) SILTY SAND, (Granular B); dark brown; non-cohesive, very dense, moist	0.15	1	GS		
		(SM) SILTY SAND, some gravel; brown to grey (TILL); dry, very dense	60.96 0.76	2	SS	55	
1							Bentonite
		Weathered bedrock, possible cobbles and boulders	60.20 1.52	3	SS	50	
		END OF BOREHOLE/DRILLHOLE	59.87 1.85				
2							

Notes:

1. Auger refusal.



ADDITIONAL LAB. TESTING

DEPTH SCALE
1 : 50

wsp GOLDER

LOGGED: PK
CHECKED: AKP

PROJECT: 22530229 (3000)

RECORD OF DRILLHOLE: BH22-02B

SHEET 2 OF 2

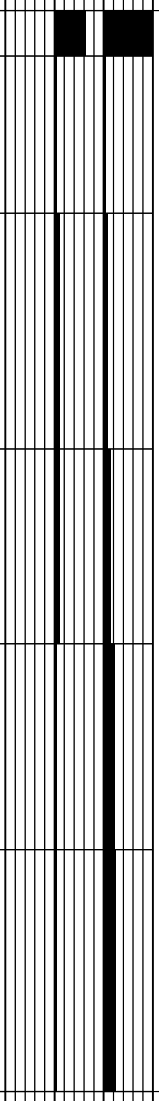
LOCATION: N 442665.4 ;E 5028039.0
INCLINATION: -90° AZIMUTH: ---
DRILLING DATE:
DRILL RIG:
DRILLING CONTRACTOR: Marathon Drilling
DATUM: Geodetic

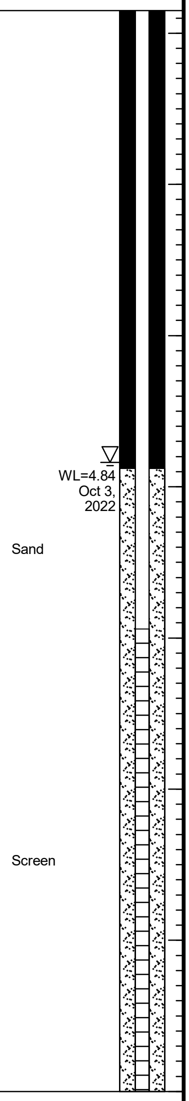
JN - Joint	BD - Bedding	PL - Planar	PO - Polished
FLT - Fault	FO - Foliation	CU - Curved	K - Slickensided
SHR - Shear	CO - Contact	UN - Undulating	SM - Smooth
VN - Vein	OR - Orthogonal	ST - Stepped	Ro - Rough
CJ - Conjugate	CL - Cleavage	IR - Irregular	MB - Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN FLUSH	RECOVERY TOTAL CORE % 80 60 40 20	RECOVERY SOLID CORE % 80 60 40 20	R.Q.D. % 80 60 40 20	FRACT. INDEX PER 0.25 m 5 10 15 20	DISCONTINUITY DATA B Angle 0 90 180 270	DIP w.r.t. CORE AXIS 0 30 60 90	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec 10^{-6} 10^{-5} 10^{-4} 10^{-3}	Diametral Point Load Index (MPa) 2 4 6	RMC -Q' AVG.
		Continued from Record of Borehole 22-02B		59.87															
2	HQ-Coring	Fresh fine-medium grained, slightly porous to non-porous, grey LIMESTONE bedrock with thin Shale interbeds		1.85	1														
					2														
3																			
					3														
4																			
5					4														
6																			
7					5														
8					6														
9				52.72 9.00															
10																			
11																			





DEPTH SCALE
1 : 50

LOGGED: PK
CHECKED: AKP

PROJECT: 22530229 (3000)

LOCATION: N 442716.10; E 5028019.00

RECORD OF BOREHOLE: BH22-03

BORING DATE: August 30, 2022

SHEET 1 OF 2

DATUM: Geodetic

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

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	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. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10⁻⁶ 10⁻⁵ 10⁻⁴ 10⁻³); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	61.68							
0		CONCRETE BLOCK	0.00	1	GS			○		Concrete
		FILL - (GP) GRAVEL, poorly graded, trace sand; dry	60.92 0.76	2	SS	16				Bentonite
1		(GP) sandy GRAVEL, trace silt; grey (TILL); dry, compact to very dense	60.31 1.37							
		END OF BOREHOLE/DRILLHOLE	1.52							
2		Notes: 1. Auger refusal.								
3										
4										
5										
6										
7										
8										
9										
10										

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: PK

CHECKED: AKP

PROJECT: 22530229 (3000)

RECORD OF DRILLHOLE: BH22-03

SHEET 2 OF 2

LOCATION: N 442716.1 ;E 5028019.0

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE:

DRILL RIG:

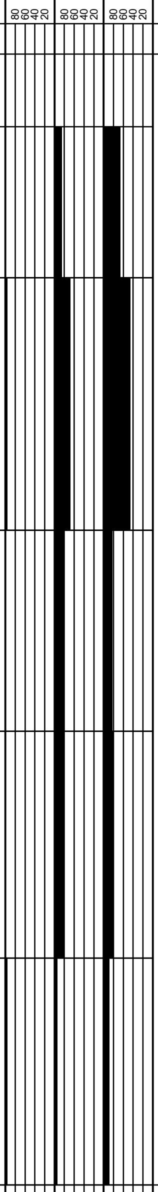
DRILLING CONTRACTOR: Marathon Drilling

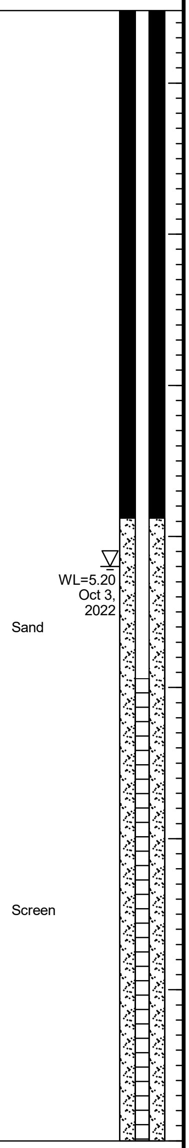
DATUM: Geodetic

JN - Joint
FLT - Fault
SHR- Shear
VN - Vein
CJ - Conjugate
BD- Bedding
FO- Foliation
CO- Contact
OR- Orthogonal
CL - Cleavage
PL - Planar
CU- Curved
UN- Undulating
ST - Stepped
IR - Irregular
PO- Polished
K - Slickensided
SM- Smooth
Ro - Rough
MB- Mechanical Break
BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		Continued from Record of Borehole 22-03		60.16															
	HQ-Coring	Fresh fine-medium grained, slightly porous to non-porous, grey LIMESTONE bedrock with thin Shale interbeds		1.52															
2					1														
3					2														
4																			
5					3														
6					4														
7																			
8					5														
9				52.68 9.00															
10																			
11																			





DEPTH SCALE

1 : 50

wsp GOLDER

LOGGED: PK

CHECKED: AKP

GTA-RCK 004 S:\CLIENTS\LASALLE_INVESTMENT_MANAGEMENT\1560_SCOTT_ST_OTTAWA\02_DATA\GINT\1560_SCOTT_ST_OTTAWA.GPJ GAL-MISS.GDT 11/2/22

APPENDIX B

Borehole and Test Pit Records – Previous Investigation (McRostie Genest Middlemiss and Associates)

McROSTIE GENEST MIDDLEMISS
& ASSOCIATES LTD. & ASSOCIÉS LTÉE
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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.03 m DATE May 26 & June 2,86

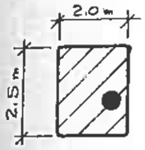
NOTES See Plate No. 2

HOLE / FORAGE & Test Pit No. 86-4
N 60 E 30

~~Probing or~~ ~~Vane Test~~ ~~Sondage ou~~ ~~Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~



water at El. 60.73 →

Bottom of pit →

Depth in metres / Profondeur - mètres	Description of soil / Du sol	Depth in metres / Profondeur - mètres	Elevation m / Niveau m
	Ground Surface - Niveau du Sol	0	62.03
	FILL - sand gravel metal wood concrete & brick	1.00	61.03
		2.20	59.83
	LIMESTONE core recovery 98%	2.95	59.08
	LIMESTONE core recovery 99%	3.94	58.09
	LIMESTONE core recovery 100%	4.36	57.67
	LIMESTONE core recovery 100%	5.64	56.39
	LIMESTONE core recovery 100%	6.91	55.12
	LIMESTONE core recovery 100%	7.20	54.93
	Bottom of hole		

← water level June 4,86 El. 60.83

0 25 50 75 100

WATER CONTENT % TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 6

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY, CAROTTE RECUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

McROSTIE GENEST MIDDLEMISS
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SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

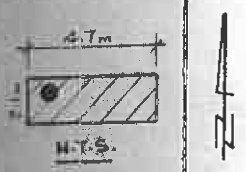
Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO): 61.62 m
DATE: May 28 & June 4,86
NOTES: See Plate No. 2

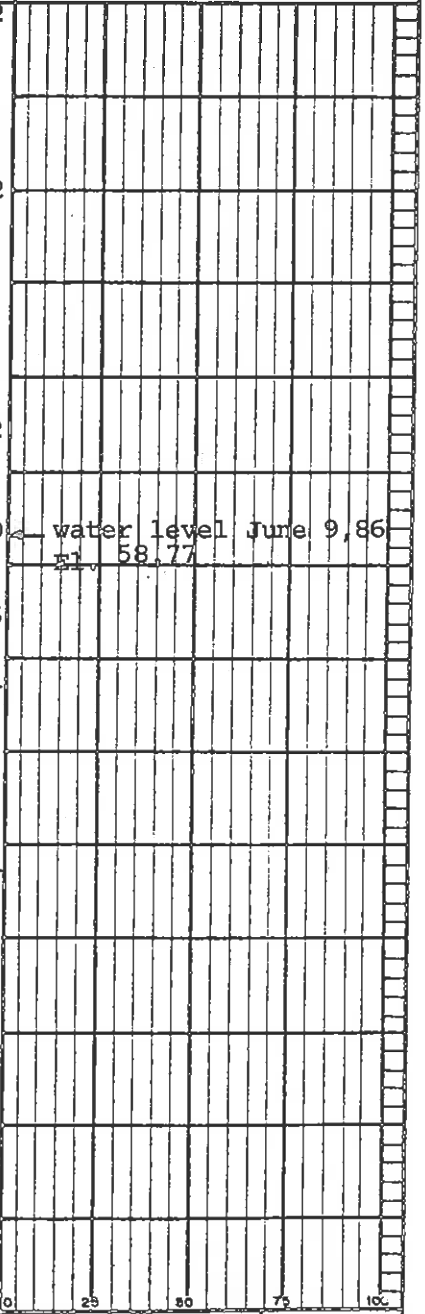
HOLE / FORAGE No. & Test Pit 86-5
N 109 E 7

DEPTH IN METRES / PROFONDEUR - MÈTRES
Essai - Standard Pénétration / Blows - Coups / 30cm
SAMPLE / ÉCHANTILLON No.
~~Probing or Vane Test~~ ~~Sondage au Essai au Scissomètre~~
Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod
~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~



	DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
		0	61.62
	FILL - sand gravel & topsoil with some crushed stone brick & wood & a little metal & ashes	1.00	60.62
water seepage at El. 59.62			
Bottom of pit		2.30	59.32
	LIMESTONE core recovery 98%	2.82	58.80
seam at El. 58.35	LIMESTONE core recovery 96%	3.27	58.35
seam at El. 58.05 seam at El. 58.02	core recovery 97%	3.61	58.01
seam at El. 57.01	LIMESTONE core recovery 99%	4.61	57.01
	LIMESTONE core recovery 100%	5.84	55.78
	core recovery 100%	5.93	55.69
seam at El. 54.90	LIMESTONE core recovery 100%	6.72	54.90
	LIMESTONE core recovery 100%	7.33	54.29
	Bottom of hole		

water level June 9,86 El. 58.77



R = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT % TENEUR EN EAU
NATURAL / NATURELLE —— ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ —— ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ —— △

PLATE / PLAQUE No. 7

McROSTIE GENEST MIDDLEMISS
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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
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Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 62.21 m DATE May 27 & June 3,86

NOTES See Plate No. 2

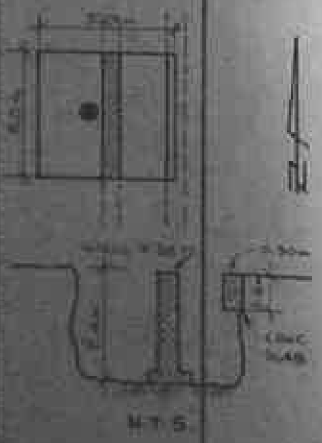
HOLE FORAGE No. & Test Pit 86-6
N. 94 E38

Probing or Vane Test / Sondage ou Essai au Scissomètre
Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

Blows / 30 cm or Shear Strength (kPa)
Coups / 30 cm ou Résistance au Cisaillement (kPa)

DEPTH IN METRES PROFONDEUR - MÈTRES	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
		Ground Surface - Niveau du Sol	0	62.21
1		FILL - sand gravel ashes brick wood and boulders up to 0.60 m dia.	1.00	61.21
2		Bottom of pit	2.40	59.81
3		LIMESTONE core recovery 97%	3.80	58.41
4		LIMESTONE core recovery 98%	5.32	56.89
		LIMESTONE core recovery 100%	6.82	55.39
		LIMESTONE core recovery 100%	7.35	54.86
		Bottom of hole		

overnight water level
El. 60.73



0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ———— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ———— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ — △

PLATE PLAQUE No. 8

[illegible]

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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

Holland and Spencer

SF 2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.41 m DATE May 27 & June 4,86

NOTES See Plate No. 2

HOLE / FORAGE No. & Test Pit 86-7, cont'
N 93 E 97

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~
Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod
~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

	Blows - Coups / 30 cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL ~~Ground Surface - Niveau du Sol~~	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				7.00	55.41
			core recovery 99%	7.37	55.04
			LIMESTONE		
1cm seam at El. 54.59 →			core recovery 94%	7.83	54.58
			Bottom of hole		

8
9
10
11
12
13
14

0 25 50 75 100

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 9

McROSTIE GENEST MIDDLEMISS
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SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.41 m DATE May 27 & June 4,86

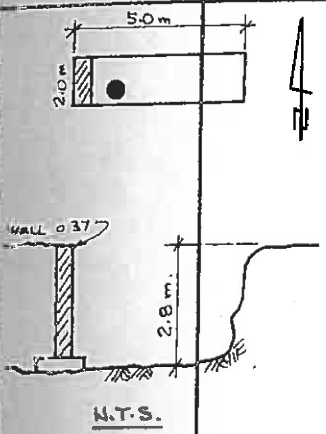
NOTES See Plate NO. 2

HOLE / FORAGE No. & Test Pit 86-7
N 93 E 97

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau __________ Hammer
Chute Libre __________ Drop
No Casing - Sans Tubage
Barre __________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~



Small Scale Penetrometer kPa / Petit Pénétromètre kPa	Essai-Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL — Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
				0	62.41
			FILL - sand brick metal concrete blocks rubber broken rock & a few large pieces of concrete	1.00	61.41
				2.00	60.41
bottom of pit			LIMESTONE	2.80	59.61
1cm seam at El.59.32			core recovery 100%	3.09	59.32
			LIMESTONE		
seam at El. 57.71			core recovery 100%	4.70	57.71
			LIMESTONE		
7cm soft drilling at El. 56.33			core recovery 100%	5.96	56.45
1cm soft drilling at El. 56.23			LIMESTONE		
				7.00	55.41
			Borehole continued		

water level June 9, 86
El. 60.33

0 25 50 75 100

WATER CONTENT % TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 10

R: REMOULDED - REMANIÉ
CR: CORE RECOVERY, CAROTTE RECUPÉRÉE
NR: NO RECOVERY - NON RÉCUPÉRÉ

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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.67 m DATE May 27 & June 3,86

NOTES See Plate No. 2

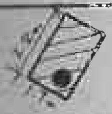
HOLE / FORAGE No. & Test Pit 86-8
N 107 E 139

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau __________ Hammer
Chute Libre __________ Drop
No Casing - Sans Tubage
Barre __________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES / PROFONDEUR - MÈTRES | Field Vane / Penetrometer kPa | Essai - Standard Penetration / Blows - Coups / 30 cm | SAMPLE No. / ÉCHANTILLON



M.T.S.

DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
	0	61.67
FILL - crushed stone	0.15	61.52
FILL - fine sand & ashes	0.40	61.27
ORGANIC material	0.72	60.95
LIMESTONE core recovery 91%	0.97	60.70
LIMESTONE core recovery 100%	1.73	59.94
LIMESTONE core recovery 100%	2.14	59.53
LIMESTONE core recovery 94%	2.52	59.15
LIMESTONE core recovery 100%	4.14	57.53
LIMESTONE core recovery 99%	5.78	55.89

Bottom of pit → (at 0.72)

Seam at El.56.38 →

Bottom of hole

← overnight water level
El. 61.27

0 25 50 75 100

1
2
3
4
5
6
7

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ——— ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ ——— △

PLATE / PLAQUE No. 11

McROSTIE GENEST MIDDLEMISS
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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
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Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.06 m DATE May 27 & June 3,86

NOTES See Plate No. 2

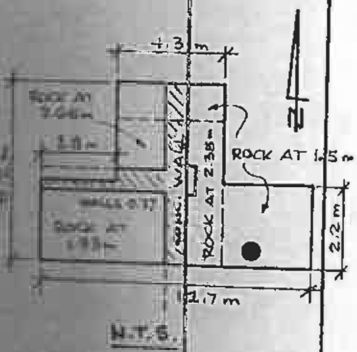
HOLE / FORAGE No. & Test pit 86-9
N 63 E 114

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ______ Hammer
Chute Libre ______ Drop
No Casing - Sans Tubage
Barre ______ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa) - Coups/30cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES / PROFONDEUR EN MÈTRES · Small Scale Penetrometer kPa / Petit Pénétromètre kPa · Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE / ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m	
			0	62.06	
		FILL - sand gravel [illegible] boulders brick broken rock wood metal & ashes			
bottom of pit →			1.50	60.56	
		LIMESTONE core recovery 100%			
3cm seam at El. 60.24 →			1.82	60.24	
		core recovery 80%	1.90	60.16	← overnight water level El. 60.08
		LIMESTONE			
1cm seam at El. 59.88 →		core recovery 81%	2.26	59.80	
		LIMESTONE core recovery 100%	3.52	58.54	
		LIMESTONE core recovery 100%	4.52	57.54	
seam at El. 56.27 →		LIMESTONE core recovery 100%	5.79	56.27	
		LIMESTONE core recovery 95%	6.60	55.46	
		Bottom of hole			



0 25 50 75 100

RM: REMOULDED - REMANIÉ
CR: CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR: NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT % TENEUR EN EAU
NATURAL / NATURELLE ———— ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ — △

PLATE / PLAQUE No. 12

McROSTIE GENEST MIDDLEMISS
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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
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Holland and Spencer

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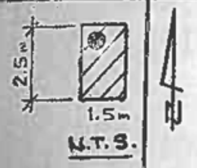
ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 61.96 m DATE May 28 & June 4,86

NOTES See Plate No. 2

HOLE FORAGE No. & Test Pit 86-10
N 132 E 30



	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
	Ground Surface - Niveau du Sol	0	61.96
	FILL - crushed stone	0.10	61.86
	FILL - sand & gravel with some ashes coal metal & wood		
Bottom of pit →	LIMESTONE	1.07	60.89
seam at El. 60.61 →	core recovery 80%	1.27	60.69
	core recovery 100%	1.50	60.46
	core recovery 100%	1.60	60.36
seam at El. 60.20 →	core recovery 100%	1.80	60.16
seam at El. 60.08 →	core recovery 100%	1.90	60.06
		3.00	58.96
	LIMESTONE		
		4.00	57.96
		5.00	56.96
seam at El. 56.19 →	core recovery 99%	5.77	56.19
	LIMESTONE		
	core recovery 100%	6.57	55.39
	Bottom of hole		

← water level June 9,86 El. 58.90

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

0 25 50 75 100

R: REMOULDED - REMANIÉ
CR: CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT % TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No. 13

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.73 m
DATE May 28 & June 3,86
NOTES See Plate No. 2

HOLE / FORAGE No. & Test Pit 86-11
N 195 E 9

Blows - Coups / 30 cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
		Ground Surface - Niveau du Sol	0	61.73
ASPHALT			0.08	61.65
		FILL - crushed stone	0.20	61.53
		FILL - sand & ashes with some metal wood & pieces of electric wire		
Bottom of pit			1.15	60.58
all water lost at El.60.08		LIMESTONE core recovery 95%	2.66	59.07
		LIMESTONE core recovery 100%	4.16	57.57
		LIMESTONE core recovery 93%	5.68	56.05
		LIMESTONE core recovery 100%	6.20	55.53
		Bottom of hole		

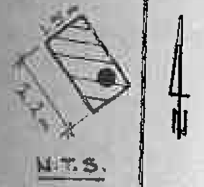
~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ______ Hammer
Chute Libre ______ Drop
No Casing - Sans Tubage
Barre ______ Dia. Rod

~~Blows/30cm or Shear Strength (kPa)~~
~~Coups/30cm ou Résistance au Cisaillement (kPa)~~

overnight water level El. 59.69

0 25 50 75 100



RE - REMOULDED - REMANIÉ
CR - CORE RECOVERY - CAROTTE RECUPÉRÉE
NR - NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT % TENEUR EN EAU
NATURAL NATURELLE ———— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ —— △

PLATE PLAQUE No. 14

McROSTIE GENEST MIDDLEMISS
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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.67 m
DATE May 30 & June 2,86
NOTES See Plate No. 2

HOLE / FORAGE No. & Test Pit 86-12
N 224 E 47

~~Probing or~~ ~~Vane Test~~ ~~Sondage ou~~ ~~Essai au Scissomètre~~
Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod
~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
	FILL sand & crushed stone with a trace of metal & ashes	0	61.67
Bottom of pit →	LIMESTONE core recovery 54%	0.52	61.15
	LIMESTONE core recovery 60%	1.02	60.65
	LIMESTONE core recovery 91%	2.52	59.15
	LIMESTONE core recovery 85%	4.02	57.65
	Bottom of hole	5.57	56.10

all water lost at El.57.44
all water returning at El.57.45

water level June 4,86
El. 58.86

Blows - Coups / 30cm

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 15

RS = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

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SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO): 61.73 m

DATE: May 30 & June 4,86

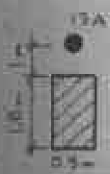
NOTES: See Plate No. 2

HOLE / FORAGE No.: & Test Pit 86-13 / 86-13A
N 198 E 82

~~Probing or Vane Test~~ ~~Sondage au Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~



M.T.S.

DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
Ground Surface - Niveau du Sol	0	61.73
FILL - topsoil	0.20	61.53
FILL - sand & gravel with a trace of ashes & metal		
Bottom of pit →	0.80	60.93
LIMESTONE core recovery 86%	2.32	59.41
LIMESTONE core recovery 100%	3.82	57.91
LIMESTONE core recovery 61%	4.72	57.01
LIMESTONE core recovery 94%	5.80	55.93
Bottom of hole		

water level June 9,86
El. 60.73

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 16

R - REMOULDED - REMANIÉ
CR - CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR - NO RECOVERY - NON RÉCUPÉRÉ

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.43 m DATE May 30, 1986

NOTES See Plate No. 2

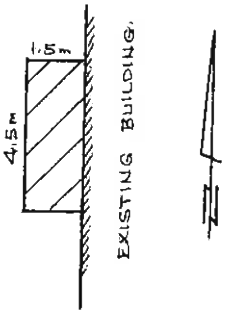
~~HOLE~~ ~~FORAGE~~ No. Test Pit N 60 E 00

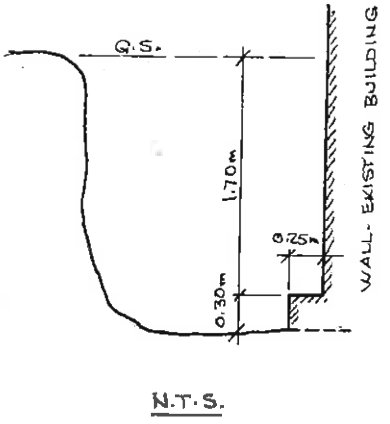
~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Morteau __________ Hammer
Chute Libre __________ Drop
No Casing - Sans Tubage
Barre __________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
		0	61.43
	FILL - topsoil	0.30	61.13
	FILL - sand & gravel with some topsoil brick & concrete blocks with a little metal ashes & glass	2.00	59.43
	Bottom of pit on rock		





N.T.S.

0 25 50 75 100

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY, CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT % TENEUR EN EAU
NATURAL NATURELLE ○
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No. 24

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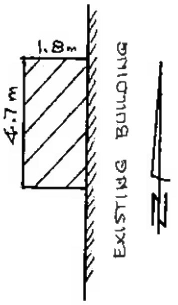
~~HOLE~~ ~~FORAGE~~ No. Test Pit N 90 E 00

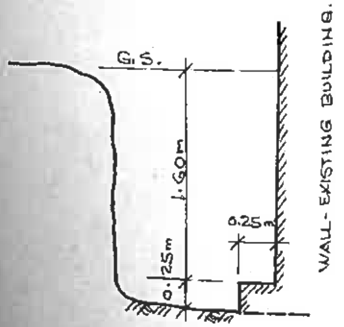
ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.37 m DATE May 30, 1986

NOTES See Plate No. 2

DEPTH IN METRES PROFONDEUR METRES	Small Scale Penetrometer kPa / Petit pénétromètre kPa	Essai - Standard Pénétration / Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - METRES	ELEVATION m NIVEAU m
					0	61.37
				FILL - topsoil	0.30	61.07
1				FILL - sand gravel & topsoil with some brick metal concrete blocks wood glass & a little organic material	1.85	59.52
2				Bottom of pit on rock		
3						
4						
5						
6						
7						

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~
Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod
~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~





N.T.S.

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE
PLAQUE
No. 25

R - REMOULDED - REMANIÉ
[illegible]
[illegible]
NR - NO RECOVERY - NON RÉCUPÉRÉ

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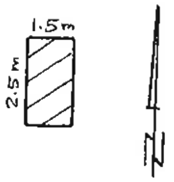
ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.91 m DATE May 26, 1986

NOTES See Plate No. 2

~~HOLE~~ ~~FORAGE~~ No. Test Pit N 90 E 30

DEPTH IN METRES / PROFONDEUR - MÈTRES	Small Vane / Penetrometer / kPa / Petit / Pénétromètre / kPa	Essai - Standard Pénétration / Blows - Coups / 30cm	SAMPLE / ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
					0	61.91
1	water at El. 60.71 →			FILL - sand & organic material with some ashes brick broken rock & boulders		
2				Bottom of pit on rock	2.05	59.86
3						
4						
5						
6						
7						



N.T.S.

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE
PLAQUE
No. 26

R : REMOULDED - REMANIÉ
CR : CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR : NO RECOVERY - NON RÉCUPÉRÉ

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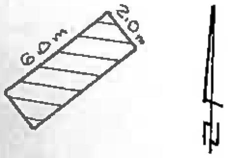
ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 61.25 m DATE May 29, 1986

NOTES See Plate No. 2

~~HOLE~~ ~~FORAGE~~ No.
Test Pit
N 120 E 00

DEPTH IN METRES PROFONDEUR - MÈTRES	Small Scale Penetrometer kPa Petit Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface - Niveau du Sol	0	61.25
				FILL - crushed stone	0.10	61.15
				FILL - sand gravel & topsoil with some brick metal ashes & boulders & a little cloth & glass		
1						
2	water seepage at El. 59.30			Bottom of pit on rock	1.95	59.30
3						
4						
5						



N.T.S.

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Mouton ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU

NATURAL
NATURELLE ——— ⊙
LIQUID LIMIT
LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT
LIMITE DE PLASTICITÉ ——— △

PLATE
PLAQUE
No.
27

[illegible] REMOULDED - REMANIÉ
[illegible] CORE RECOVERY
[illegible]
[illegible] NON RÉCUPÉRÉ

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.05 m DATE May 28, 1986

~~HOLE~~ ~~FORAGE~~ No. Test Pit N 120 E 30

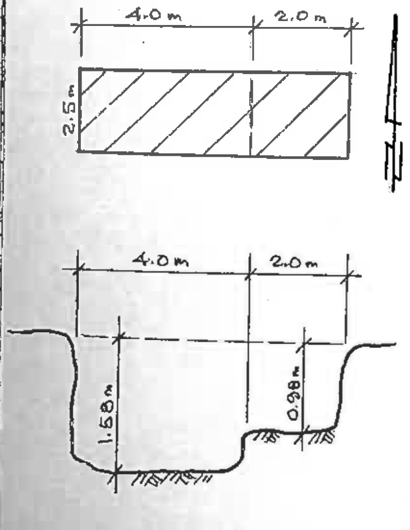
NOTES See Plate No. 2

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Mouton ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - MÈTRES	Small Soils Penetrometer kPa Petit Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface - Niveau du Sol	0	62.05
				FILL - crushed stone	0.10	61.95
				FILL - sand & gravel with some ashes & a little wood brick & topsoil	0.50	61.55
1				medium dense coarse SAND & GRAVEL with some boulders up to 0.6 m dia.	1.58	60.47
2				Bottom of pit on rock		
3						
4						
5						
6						
7						



N.T.S.

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU

NATURAL NATURELLE ———— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ———— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ ———— △

PLATE PLAQUE No. 28

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

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Holland and Spencer

SE2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.24 m DATE May 26, 1986

NOTES See Plate No. 2

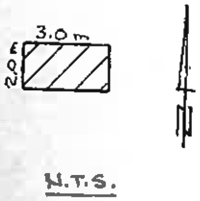
~~HOLE~~ ~~FORAGE~~ No. Test Pit N 120 E 120

~~Probing or~~ ~~Vane Test~~ ~~Sondage ou~~ ~~Essai au Scissomètre~~

Marteau __________ Hammer
Chute Libre __________ Drop
No Casing - Sans Tubage
Barre __________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES / PROFONDEUR - MÈTRES	[illegible] kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface - Niveau du Sol	0	62.24
				FILL - sand & clay with some wood brick & concrete		
1						
	water seepage at El. 60.54				1.70	60.54
2				ORGANIC material		
					2.45	59.79
				Bottom of pit on rock		
3						
4						
5						
6						
7						



0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE —— ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ —— ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ —— △

PLATE / PLAQUE No. 29

RS. REMOULDED - REMANIÉ
CR. CORE RECOVERY / CAROTTE RÉCUPÉRÉE
NR. NO RECOVERY - NON RÉCUPÉRÉ

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.74 m DATE May 30, 1986

NOTES See Plate No. 2

~~HOLE~~ ~~FORAGE~~ No. Test Pit
N 150 E 00

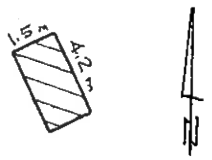
~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - MÈTRES	[illegible] kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface - Niveau du Sol	0	61.74
				FILL - crushed stone	0.10	61.64
				FILL - sand gravel & topsoil with some brick & ashes & a little metal & glass	1.25	60.49
				Bottom of pit on rock		

1
2
3
4
5
6
7



N.T.S.

R: REMOULDED - REMANIÉ
CR: CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR: NO RECOVERY - NON RÉCUPÉRÉ

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE
PLAQUE
No. 30

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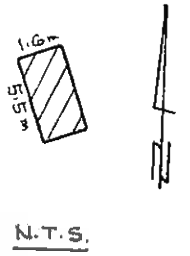
ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.96 m DATE May 28, 1986

NOTES See Plate No. 2

~~HOLE~~ ~~FORAGE~~ No. Test Pit N 150 E 30

DEPTH IN METRES / PROFONDEUR - METRES	Shear Scale Penetrometer kPa / Petit Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES / PROFONDEUR - METRES	ELEVATION m / NIVEAU m
				Ground Surface - Niveau du Sol	0	61.96
				FILL - crushed stone		
				FILL - sand & gravel with some wood ashes metal & brick	0.10	61.86
				rock removed by shovel	1.00	60.96
				Bottom of pit on rock	1.14	60.82



~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

R: REMOULDED - REMANIÉ
CR: CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR: NO RECOVERY - NON RÉCUPÉRÉ

PLATE / PLAQUE No. 31

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ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 61.50 m DATE May 26, 1986

NOTES See Plate No. 2

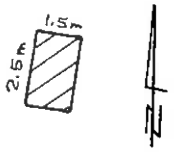
~~HOLE~~ ~~FORAGE~~ No. Test Pit
N 150 E 120

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - MÈTRES	Shell Vane Scissomètre kPa Petit Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
					0	61.50
				FILL - topsoil sand gravel bricks & pieces of wood		
1						
	water seepage at El. 60.20				1.35	60.25
				ORGANIC material	1.60	59.95
				Bottom of pit on rock		
2						
3						
4						
5						
6						
7						



N.T.S.

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU

NATURAL
NATURELLE ——— ⊙
LIQUID LIMIT
LIMITE DE LIQUIDITÉ —— ⊡
PLASTIC LIMIT
LIMITE DE PLASTICITÉ —— △

PLATE
PLAQUE
No. 32

R : REMOULDED - REMANIÉ
CR : CORE RECOVERY
CAROTTE RECUPÉRÉE
NR : NO RECOVERY - NON RÉCUPÉRÉ

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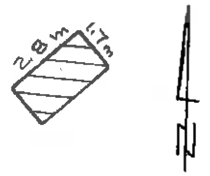
ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 61.67 m DATE May 29, 1986

NOTES See Plate No. 2

~~HOLE~~
~~FORAGE~~ No.
Test Pit
N 150 E 150

DEPTH IN METRES PROFONDEUR - MÈTRES	Small Scale Penetrometer kPa Petit Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface - Niveau du Sol	0	61.67
				FILL - crushed stone	0.10	61.57
				FILL - topsoil & sand with some broken rock ashes metal & glass	1.80	60.87
				Bottom of pit on rock		



N.T.S.

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau __________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~

0 25 50 75 100

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ——— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ ——— △

PLATE PLAQUE No. 33

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.37 m DATE May 28, 1986

NOTES See Plate No. 2

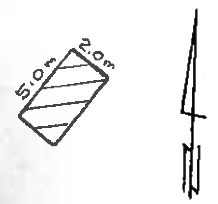
~~HOLE~~ ~~FORAGE~~ No. Test Pit N 180 E 30

~~Probing or Vane Test~~ ~~Sondage au Essai au Scissomètre~~

Marteau __________ Hammer
Chute Libre __________ Drop
No Casing - Sans Tubage
Barre __________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR-METRES	[illegible]	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
					0	62.37
				FILL - crushed stone	0.10	62.27
1				FILL - sand gravel & topsoil with some ashes brick broken rock metal & wood	1.80	60.57
2				Bottom of pit on rock		
3						
4						
5						
6						
7						



N.T.S.

0 25 50 75 100

R - REMOULDED - REMANIÉ
CR - CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR - NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ——— ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ ——— △

PLATE / PLAQUE No. 34

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ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 61.73 m DATE May 30, 1986

NOTES See Plate No. 2

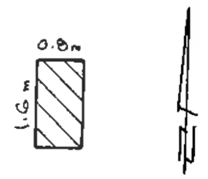
~~HOLE~~
~~FORAGE~~ No.
Test Pit
N 180 E 82

~~Probing or~~ ~~Vane Test~~ ~~Sondage ou~~ ~~Essai au Scissomètre~~

Marteau __________ Hammer
Chute Libre __________ Drop
No Casing - Sans Tubage
Barre __________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES / PROFONDEUR MÉTRES	Pocket Penetrometer kPa / Petit Pénétromètre kPa	Essai - Standard Pénétration / Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
				Ground Surface - Niveau du Sol	0	61.73
				FILL - topsoil	0.20	61.53
				FILL - fine sand with a little metal & brick	0.70	61.03
				Bottom of pit on rock		



N.T.S.

0 25 50 75 100

R - REMOULDED - REMANIÉ
CR - CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR - NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL
NATURELLE ⊙
LIQUID LIMIT
LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT
LIMITE DE PLASTICITÉ △

PLATE
PLAQUE
No.
35

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.06 m DATE May 29, 1986

NOTES See Plate No. 2

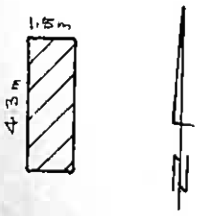
~~HOLE~~ ~~FORAGE~~ No. Test Pit N 180 E 110

~~Probing or~~ ~~Vane Test~~ ~~Sondage ou~~ ~~Essai au Scissomètre~~

Marteau ____________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - MÈTRES	[illegible] kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface - Niveau du Sol	0	62.06
				FILL - topsoil	0.25	61.81
				FILL - fine sand	0.50	61.56
				TOPSOIL	0.58	61.48
1				loose coarse SAND & GRAVEL	0.90	61.16
2	water seepage at El. 59.96		→	medium dense sandy TILL with a few boulders up to 0.45 m dia.	2.30	59.76
3				Bottom of pit on rock		
4						
5						
6						
7						



N.T.S.

0 25 50 75 100

R = REMOULDED - REMANIÉ
CORE RECOVERY
CR = CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ——— ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ ——— △

PLATE / PLAQUE No. 36

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO): 61.14 m

DATE: May 29, 1986

NOTES: See Plate No. 2

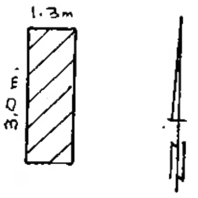
~~HOLE~~ ~~FORAGE~~ No. Test Pit N 210 E 6

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES / PROFONDEUR MÈTRES	[illegible] kPa / Petit Pénétromètre kPa	Essai - Standard Pénétration / Blows - Coups / 30 cm	SAMPLE / ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
				Ground Surface - Niveau du Sol	0	61.14
				FILL - crushed stone	0.10	61.04
				FILL - sand & gravel with some ashes broken rock brick & metal	1.00	60.14
				Bottom of pit on rock		



N.T.S.

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU

NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 37

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY / CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.38 DATE May 28, 1986

~~HOLE~~ ~~FORAGE~~ No. Test Pit
N 210 E 30 2

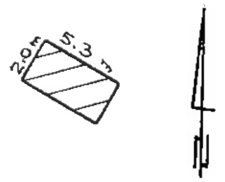
NOTES See Plate No. 2

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau _______ Hammer
Chute Libre _______ Drop
No Casing - Sans Tubage
Barre _______ Dia. Rod

~~Blows / 30 cm or Shear Strength (kPa)~~
~~Coups / 30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - METRES	[illegible] Penetrometer kPa Petit Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - METRES	ELEVATION m NIVEAU m
					0	62.38
				FILL - topsoil	0.30	62.08
1				FILL - sand & gravel with some broken rock brick metal wood glass & topsoil	1.80	60.58
2				Bottom of pit on rock		
3						
4						
5						
6						
7						



N.T.S.

0 25 50 75 100

R: REMOULDED - REMANIÉ
CR: CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR - NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU

NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 38

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 61.73 m DATE May 30, 1986

NOTES See Plate No. 2

~~HOLE~~ ~~FORAGE~~ No. Test Pit N 210 E 60

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Mouton ______ Hammer

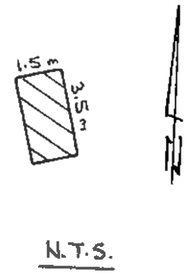
Chute Libre ______ Drop

No Casing - Sans Tubage

Barre ______ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES / PROFONDEUR - METRES	[illegible] kPa	Essai - Standard Pénétration Blows - Coups / 30 cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL / DU SOL	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
				Ground Surface - Niveau du Sol	0	61.73
				FILL - crushed stone		
					0.25	61.48
				FILL - topsoil		
					0.47	61.26
				FILL - till with a trace of brick & metal		
					0.86	60.87
				Bottom of pit on rock		



Depth scale: 1, 2, 3, 4, 5, 6, 7

Water content scale: 0, 25, 50, 75, 100

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 39

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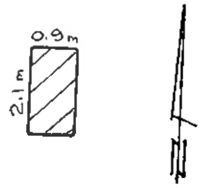
ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 61.82 m DATE May 30, 1986
NOTES See Plate No. 2

~~HOLE~~ ~~FORAGE~~ No. Test Pit
N 210 E 82

DEPTH IN METRES PROFONDEUR - MÈTRES	[illegible] Petit Pénétromètre SPs	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
					0	61.82
				FILL - topsoil		
					0.20	61.62
				FILL - medium sand with a piece of concrete pipe & a trace of metal		
					1.10	60.72
				Bottom of pit on rock		



N.T.S.

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ——— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ — △

PLATE PLAQUE No. 40

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

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Holland and Spencer

SF2687

ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU OU SOL (PROFONDEUR ZERO) 61.71 m DATE May 30, 1986

NOTES See Plate No. 2

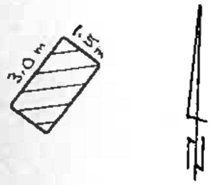
~~HOLE~~ ~~FORAGE~~ No. Test Pit N234 E 60

~~Probing or Vane Test~~ ~~Sondage au Essai au Scissomètre~~

Marteau ______ Hammer
Chute Libre ______ Drop
No Casing - Sans Tubage
Barre ______ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - MÈTRES	[illegible] kPa [illegible] Pénétromètre kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
				Ground Surface Niveau du Sol	0	61.71
				FILL - topsoil & sand with a trace of metal brick & ashes		
1				Bottom of pit on rock	0.75	60.96
2						
3						
4						
5						
6						
7						



N.T.S.

0 25 50 75 100

WATER CONTENT
% TENEUR EN EAU

NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

PLATE PLAQUE No. 41

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ELEVATION OF GROUND SURFACE (ZERO DEPTH)
NIVEAU DU SOL (PROFONDEUR ZERO) 62.17 m DATE May 30, 1986
NOTES See Plate No. 2

~~HOLE~~
~~FORAGE~~ No.
Test Pit
N 235 E 84

DEPTH IN METRES / PROFONDEUR - MÈTRES

Small Scale Penetrometer kPa / Petit Pénétromètre kPa

Essai - Standard Pénétration / Blows - Coups / 30cm

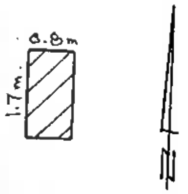
SAMPLE / ÉCHANTILLON No.

~~Probing or Vane Test~~ ~~Sondage ou Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30 cm or Shear Strength (kPa)~~
~~Coups/30 cm ou Résistance au Cisaillement (kPa)~~

DESCRIPTION OF SOIL / DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES / PROFONDEUR - MÈTRES	ELEVATION m / NIVEAU m
	0	62.17
FILL - topsoil	0.30	61.87
FILL - sand gravel & topsoil with a trace of brick & metal	1.10	61.07
Bottom of pit on rock		



N.T.S.

1
2
3
4
5
6
7

0 25 50 75 100

RM = REMOULDED - REMANIÉ
CR = CORE RECOVERY
CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

WATER CONTENT
% TENEUR EN EAU
NATURAL
NATURELLE ——— ⊙
LIQUID LIMIT
LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT
LIMITE DE PLASTICITÉ ——— △

PLATE
PLAQUE
No.
42

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 62.11 m DATE May 30, 1986

~~HOLE~~ ~~FORAGE~~ No. Test Pit N 240 E 115

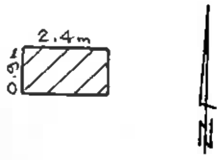
NOTES See Plate No. 2

~~Probing or~~ ~~Vane Test~~ ~~Sondage ou~~ ~~Essai au Scissomètre~~

Marteau ________ Hammer
Chute Libre ________ Drop
No Casing - Sans Tubage
Barre ________ Dia. Rod

~~Blows/30cm or Shear Strength (kPa)~~
~~Coups/30cm ou Résistance au Cisaillement (kPa)~~

DEPTH IN METRES PROFONDEUR - MÈTRES	[illegible] kPa	Essai - Standard Pénétration Blows - Coups / 30cm	SAMPLE ÉCHANTILLON No.	DESCRIPTION OF SOIL DU SOL Ground Surface - Niveau du Sol	DEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m
					0	62.11
				FILL - topsoil	0.20	61.91
				FILL - sand & gravel with some ashes brick wood metal asphalt & glass	0.95	61.16
1				boulders up to 0.6 m dia. in dense sandy TILL	1.80	60.31
2				Bottom of pit on rock		
3						
4						
5						
6						
7						



N.T.S.

R = REMOULDED - REMANIÉ
CR = CORE RECOVERY - CAROTTE RÉCUPÉRÉE
NR = NO RECOVERY - NON RÉCUPÉRÉ

0 25 50 75 100

WATER CONTENT % TENEUR EN EAU
NATURAL NATURELLE ——— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ ——— △

PLATE PLAQUE No. 43

Holland and Spencer Avenues, Beech Foundry Site, Rock Elevations

McRostie Genest Middlemiss

June 6, 1984

(Report No. SF-2481)

McROSTIE GENEST MIDDLEMISS
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SPENCER ST.

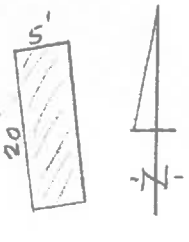
SF 2481

ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 205.2 DATE MAY 16/84

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 1

NOTES BM (EL. 206.65) GEODETIC CITY OF OTTAWA PLATE ON NORTHEAST CORNER OF OF SPERRY GYROSCOPE BLDG. AT SOUTHWEST CORNER OF PARKDALE & SPENCER

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample No. Echantillon	DUG BY TRACK MOUNTED SHOVEL DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur - Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~ MARTEAU----HAMMER CHUTE LIBRE---DROP NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~ ~~COUPS/PIED OU~~ ~~RÉSISTANCE AU CISAILLEMENT~~ ~~K/PD.2~~
					0'	205.2	
				-FILL- SAND, GRAVEL, & ASHES, WITH SOME METAL, WOOD, GLASS, & BRICK			
SLIGHT WATER SEEPAGE AT EL. 199.2					6'	199.2	
				BOTTOM OF PIT ON ROCK			



R = REMOULDED-REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

% WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ——— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ——— ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ ——— △

PLATE PLAQUE No.

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 203.9 DATE MAY 16/84

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 2

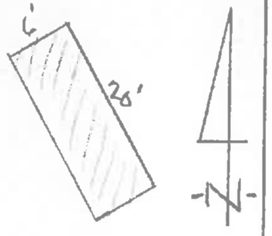
NOTES SEE PLATE No. 2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample Échantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur-Pied	Elevation Niveau
				CONCRETE SLAB	0 0.2	203.9 203.7
				- FILL - SAND WITH SOME CLAY METAL, BRICK ASHES & WOOD.		
				BOTTOM OF PIT ON ROCK	5'	198.9

~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~

MARTEAU----HAMMER
CHUTE LIBRE---DROP
NO CASING SANS TUBAGE
BARRE-----DIA. ROD

~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~
~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~



R = REMOULDED-REMANIE
CR = CORE RECOVERY / CAROTTE RECUPEREE

% WATER CONTENT / TENEUR EN EAU
NATURAL / NATURELLE ⊙
LIQUID LIMIT / LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT / LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No.

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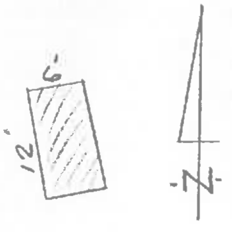
ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 203.5 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 3

NOTES SEE PLATE No. 2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample No. Echantillon	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur-Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~ MARTEAU----HAMMER CHUTE LIBRE---DROP NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~ ~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~
				CONCRETE SLAB	0.0	203.5	
				-FILL- SAND & GRAVEL WITH SOME WOOD, METAL BRICK & BROKEN ROCK	0.2	203.3	
				DENSE SANDY TILL	1.5	202.0	
				BOTTOM OF PIT ON ROCK	5.8'	197.7	



R = REMOULDED-REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ □
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 204.1 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 4

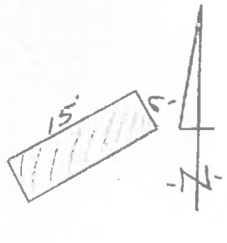
NOTES SEE PLATE No. 2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur-Pied	Elevation Niveau
				CONCRETE SLAB	0	204.1
				-FILL- SAND & GRAVEL WITH SOME METAL, ASHES, WOOD, & BRICK, WITH A FEW BOULDERS UP TO 24" Ø	0.5	203.6
				BOTTOM OF PIT ON ROCK	6.3	197.8

~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~

MARTEAU----HAMMER
CHUTE LIBRE---DROP
NO CASING SANS TUBAGE
BARRE-----DIA. ROD

~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~
~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~



R = REMOULDED-REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

WATER CONTENT %TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ☐
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 201.5 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 5

NOTES SEE PLATE No. 2

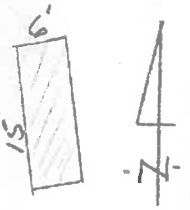
~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~

MARTEAU----HAMMER
CHUTE LIBRE---DROP

NO CASING SANS TUBAGE
BARRE-----DIA. ROD

~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~
~~COUPS/PIED OU~~ ~~RÉSISTANCE AU CISAILLEMENT K/PD.2~~

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample No. Echantillon	DESCRIPTION OF SOIL DU SOL	Depth in Feet Profondeur - Pied	Elevation Niveau
				Ground Surface – Niveau du Sol	0	201.5
				ASPHALT	0.3	201.2
				-FILL- SAND & GRAVEL	1.5'	2000
				TOPSOIL	2'	199.5
				DENSE SANDY TILL WITH SOME BOULDERS UP TO 18" ⌀	6.5'	195.0
				BOTTOM OF PIT ON ROCK		



R = REMOULDED - REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

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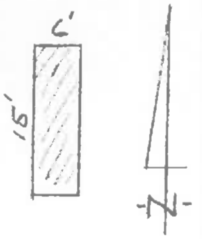
ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 203.1 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 6

NOTES SEE PLATE NO. 2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur - Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~ MARTEAU----HAMMER CHUTE LIBRE---DROP NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~BLOWS/FOOT OR~~ ~~SHEAR STRENGTH K.S.F.~~ ~~COUPS/PIED OU~~ ~~RÉSISTANCE AU CISAILLEMENT K/PD.2~~
				CONCRETE SLAB	0 0.2'	203.1 202.9	
				-FILL- SAND & GRAVEL WITH SOME METAL & WOOD, & A TRACE OF BRICK & TOPSOIL			
				BOTTOM OF PIT ON ROCK	3.6'	199.5	



R = REMOULDED-REMANIE
CR = CORE RECOVERY / CAROTTE RECUPEREE

WATER CONTENT % TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

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ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 203.8 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 7

NOTES SEE PLATE NO. 2

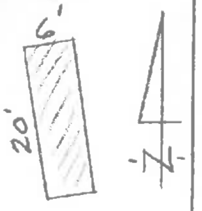
~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~

MARTEAU----HAMMER
CHUTE LIBRE---DROP

NO CASING SANS TUBAGE
BARRE-----DIA. ROD

~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~
~~COUPS/PIED OU~~ ~~RÉSISTANCE AU K/PD.2 CISAILLEMENT~~

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample No. Echantillon	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur - Pied	Elevation Niveau
				CONCRETE SLAB	0	203.8
					0.3	203.5
				-FILL- SAND, GRAVEL, & BROKEN ROCK WITH A LITTLE BRICK & METAL		
SLIGHT WATER SEEPAGE AT EL. 199.4				BOTTOM OF PIT ON ROCK	4.4'	199.4



R = REMOULDED-REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

% WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ——— ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ——— ☐
PLASTIC LIMIT LIMITE DE PLASTICITÉ ——— △

PLATE PLAQUE No.

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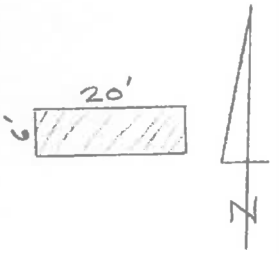
ELEVATION OF GROUND SURFACE (ZERO DEPTH) / NIVEAU DU SOL (PROFONDEUR ZERO) 203.5 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST AT 8

NOTES SEE PLATE No.2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai - Standard Penetration Blows/ft.-Coups/pd	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur - Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~ MARTEAU----HAMMER CHUTE LIBRE---DROP NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~ ~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~
				CONCRETE SLAB	0'	203.5	
				-FILL- SAND, GRAVEL, & BROKEN ROCK WITH SOME METAL, & BRICK, & A TRACE OF WOOD	0.3'	203.2	
				BOTTOM OF PIT ON ROCK	4'	199.5	



R = REMOULDED-REMANIE
CR = CORE RECOVERY / CAROTTE RECUPEREE

WATER CONTENT %TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

McROSTIE GENEST MIDDLEMISS
& ASSOCIATES LTD. & ASSOCIÉS LTÉE
CONSULTING ENGINEERS – INGÉNIEURS CONSEILS
OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

SPENCER ST.

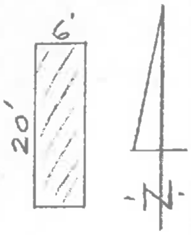
SF2481

ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 203.0 DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 9

NOTES SEE PLATE No. 2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface Niveau du Sol	Depth in Feet Profondeur-Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ MARTEAU----HAMMER CHUTE LIBRE---DROP ~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~	~~SONDAGE OU ESSAI AU MOULINET~~ NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~
				CONCRETE SLAB	0' 0.2'	203.0 202.8		
				-FILL- SAND & GRAVEL WITH SOME BRICK, BROKEN ROCK, METAL, WOOD & TOPSOIL	4.7	198.3		
				BOTTOM OF PIT ON ROCK				



% WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ☐
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

R = REMOULDED - REMANIE
CR = CORE RECOVERY - CAROTTE RECUPEREE

McROSTIE GENEST MIDDLEMISS
& ASSOCIATES LTD. & ASSOCIÉS LTÉE
CONSULTING ENGINEERS – INGÉNIEURS CONSEILS
OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

SPENCER ST.

SF2481

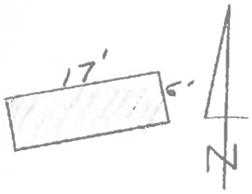
ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 204.9

DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 10

NOTES SEE PLATE No.2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur-Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ ~~SONDAGE OU ESSAI AU MOULINET~~ MARTEAU----HAMMER CHUTE LIBRE---DROP NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~ ~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~
				CONCRETE SLAB	0'	204.9	
				-FILL- SAND, GRAVEL, & BROKEN ROCK WITH SOME BRICK METAL & WOOD	0.3'	204.6	
				TOPSOIL	3.9'	201.0	
				DENSE SANDY TILL	4.3'	200.6	
				BOTTOM OF PIT ON ROCK	7.5'	197.4	



R = REMOULDED-REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ ⊡
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE PLAQUE No.

McROSTIE GENEST MIDDLEMISS
& ASSOCIATES LTD. & ASSOCIÉS LTÉE
CONSULTING ENGINEERS – INGÉNIEURS CONSEILS
OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

SPENCER ST.

SF2481

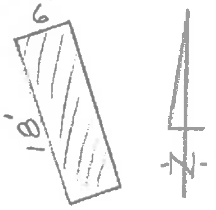
ELEVATION OF GROUND SURFACE (ZERO DEPTH) NIVEAU DU SOL (PROFONDEUR ZERO) 205.0

DATE MAY 16, 1984

~~HOLE~~ ~~FORAGE~~ No. TEST PIT 11

NOTES SEE PLATE No.2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL Ground Surface – Niveau du Sol	Depth in Feet Profondeur-Pied	Elevation Niveau	~~PROBING OR VANE TEST~~ MARTEAU----HAMMER CHUTE LIBRE---DROP ~~SONDAGE OU ESSAI AU MOULINET~~ NO CASING SANS TUBAGE BARRE-----DIA. ROD ~~BLOWS/FOOT OR SHEAR STRENGTH K.S.F.~~ ~~COUPS/PIED OU RÉSISTANCE AU CISAILLEMENT K/PD.2~~
				CONCRETE SLAB	0' 0.3	205.0 204.7	
				-FILL- SAND, GRAVEL & BROKEN ROCK WITH SOME BRICK & METAL	3.1'	201.9	
				TOPSOIL	3.4'	201.6	
				DENSE SANDY TILL	5.4'	199.6	
				BOTTOM OF PIT ON ROCK			



R = REMOULDED-REMANIE
CR = CORE RECOVERY CAROTTE RECUPEREE

WATER CONTENT %TENEUR EN EAU
NATURAL NATURELLE — ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ — □
PLASTIC LIMIT LIMITE DE PLASTICITÉ — △

PLATE PLAQUE No.

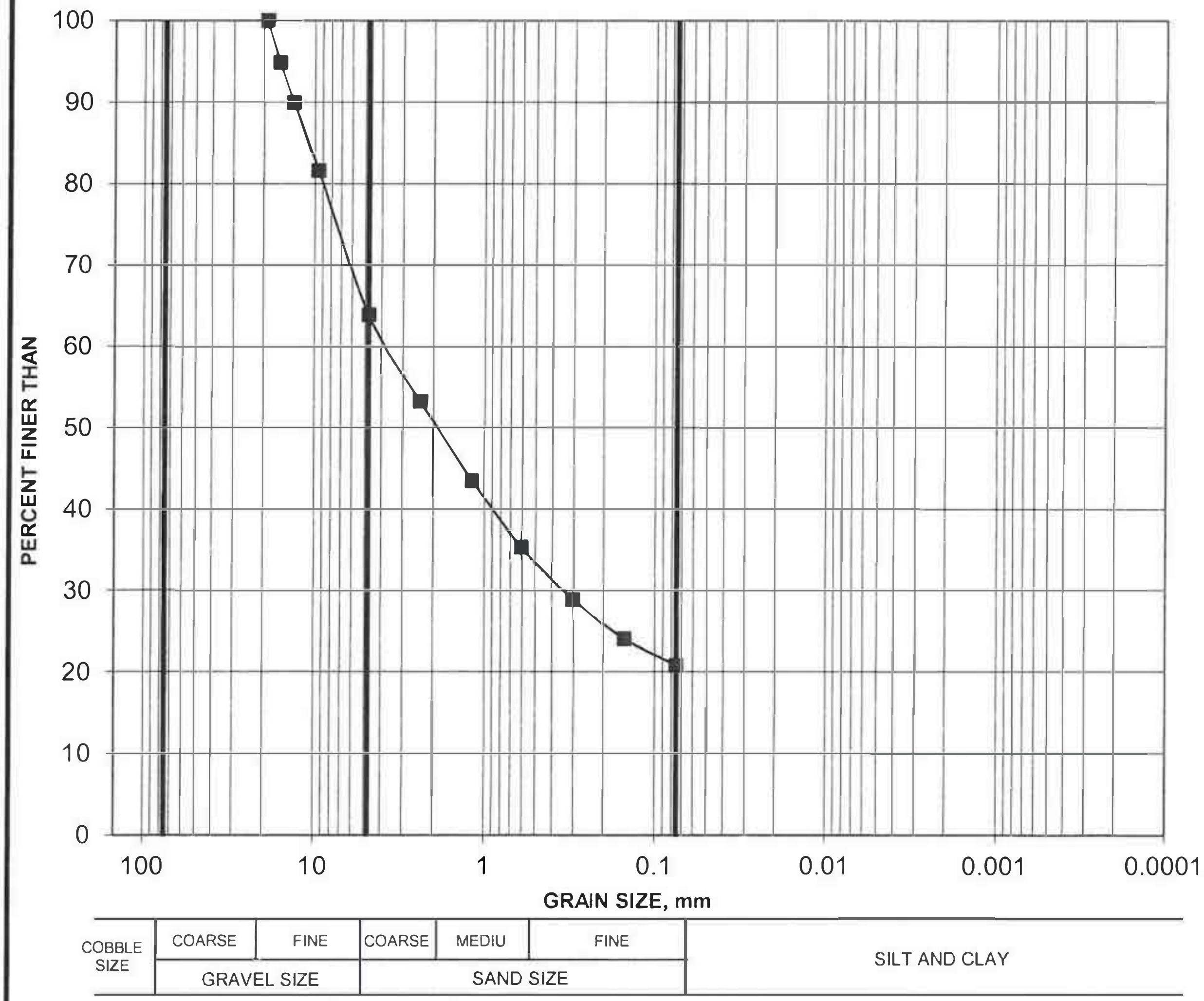
APPENDIX C

Laboratory Test Results

GRAIN SIZE DISTRIBUTION

FIGURE 2

SILTY SAND



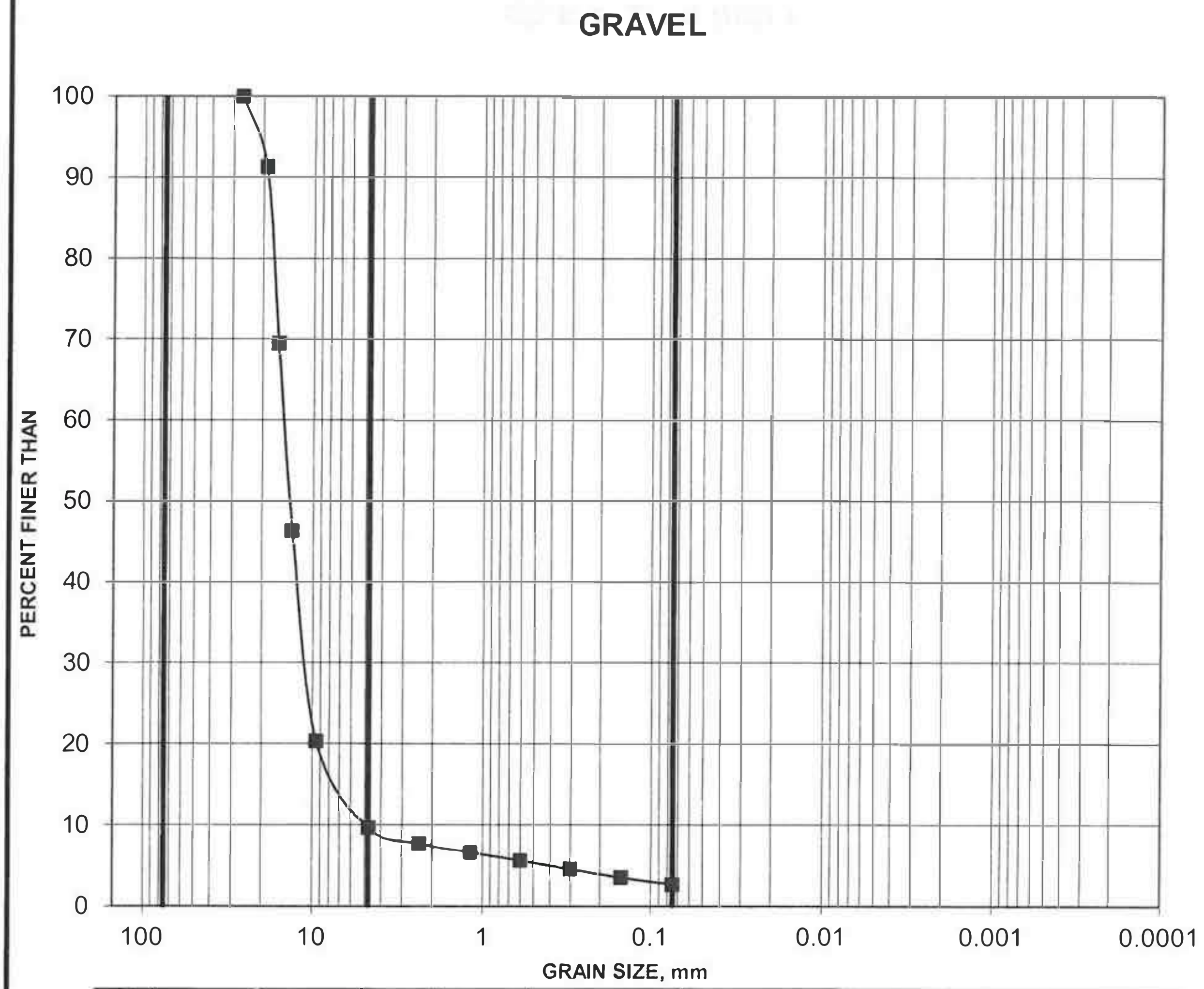
				Constituents (%)			
	Borehole	Sample	Depth (m)	Gravel	Sand	Silt	Clay
■	22-01	1	0.10-0.76	36	43	21	

Project: 22530229

GOLDER
MEMBER OF WSP

Created by: MI
Checked by: JB

GRAIN SIZE DISTRIBUTION	FIGURE 3



COBBLE SIZE	COARSE	FINE	COARSE	MEDIU	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

			Constituents (%)			
Borehole	Sample	Depth (m)	Gravel	Sand	Silt	Clay
■ 22-03	1	0.15-1.76	90	7	3	

GOLDER
MEMBER OF WSP

Project: 22530229

Created by: MI
Checked by: JVS

APPENDIX D

Results of Geophysical Testing

TECHNICAL MEMORANDUM

DATE September 21 2022 **Project No.**22530229

TO Arthur Kuitchoua Petke
Golder Associates Ltd.

FROM Geophysics Group **EMAIL abilsondarko@golder.com; cphillips@golder.com**

MASW SURVEY RESULTS – 1560 SCOTT STREET, OTTAWA, ONTARIO

This technical memorandum presents the processing and results of the Multichannel Analysis of Surface-Waves (MASW) test performed for the purpose of Seismic Site Classification for a site on 1560 Scott Street, located in Ottawa, Ontario. The geophysical testing was performed by Golder Associates Ltd. (Golder) personnel on September 15th, 2022, along the survey line shown in Plate 1, below.

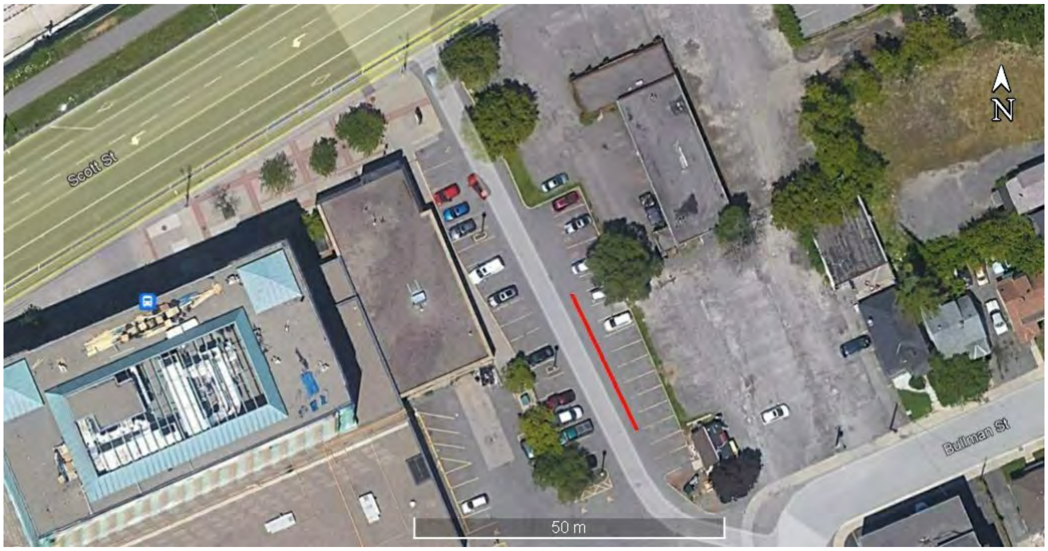


Plate 1: MASW Survey Line Location in red.

Methodology

The MASW method measures variations in surface-wave velocity with increasing distance and wavelength and can be used to infer the rock/soil types, stratigraphy and soil conditions.

A typical MASW survey requires a seismic source, to generate surface-waves, and a minimum of two geophone receivers, to measure the ground response at some distance from the source. Surface-waves are a special type of seismic wave whose propagation is confined to the near surface medium.

The depth of penetration of a surface-wave into a medium is directly proportional to its wavelength. In a non-homogeneous medium surface-waves are dispersive, i.e., each wavelength has a characteristic velocity owing to the subsurface heterogeneities within the depth interval that wavelength of surface-wave propagates through. The relationship between surface-wave velocity and wavelength is used to obtain the shear-wave velocity and attenuation profile of the medium with increasing depth.

The seismic source used can be either active or passive, depending on the application and location of the survey. Examples of active sources include explosives, weight-drops, sledgehammer and vibrating pads. Examples of passive sources are road traffic, micro-tremors and water-wave action (in near-shore environments).

The geophone receivers measure the wave-train associated with the surface-wave travelling from a seismic source at different distances from the source.

The participation of surface-waves with different wavelengths can be determined from the wave-train by transforming the wave-train results into the frequency domain. The surface-wave velocity profile with respect to wavelength (called the ‘dispersion curve’) is determined by the delay in wave propagation measured between the geophone receivers. The dispersion curve is then matched to a theoretical dispersion curve using an iterative forward-modelling procedure. The result is a shear-wave velocity profile of the tested medium with depth, which can be used to estimate the dynamic shear modulus of the medium as a function of depth.

Field Work

The MASW field work was conducted on September 15th, 2022, by personnel from the Golder Mississauga office. For the MASW line, a series of 24 low frequency (4.5 Hz) geophones were laid out at 1 metre intervals. An 8-kilogram (kg) sledgehammer and 40 kg seismic weight drop were used as seismic sources for this investigation. Seismic records were collected with seismic sources located 5 and 10 metres from and collinear to the geophone array. An example of an active seismic record collected at the site is shown in Figure 1.

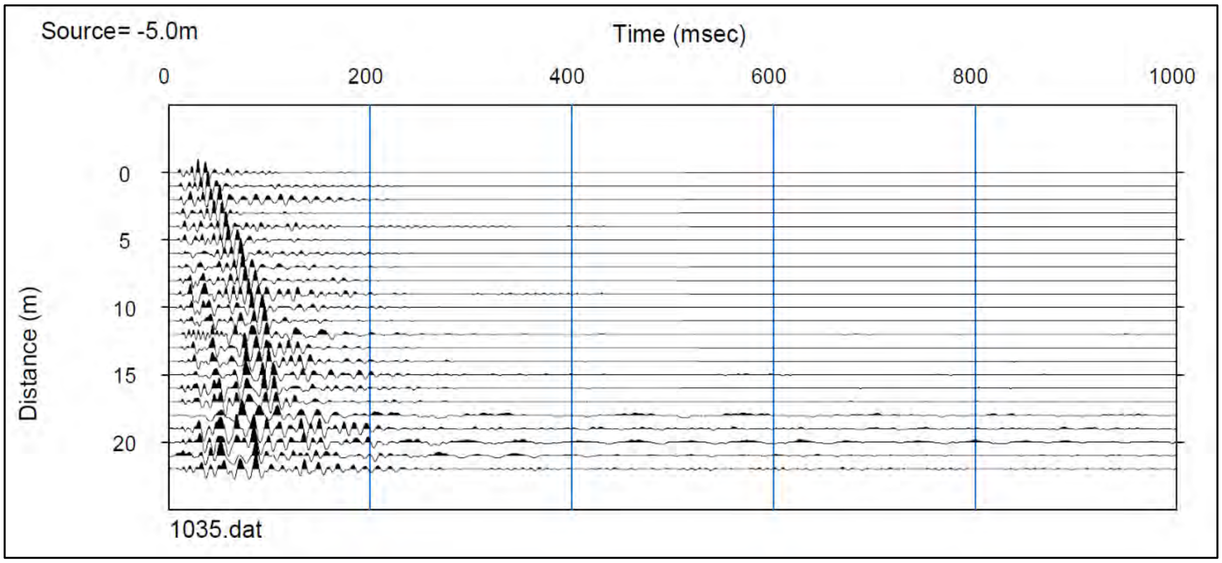


Figure 1: Typical seismic record collected for the MASW Line.

Data Processing

Processing of the MASW test results consisted of the following main steps:

1) Transformation of the time domain data into the frequency domain using a Fast-Fourier Transform (FFT) for each source location;

2) Calculation of the phase for each frequency component;

3) Linear regression to calculate phase velocity for each frequency component;

4) Filtering of the calculated phase velocities based on the Pearson correlation coefficient (r^2) between the data and the linear regression best fit line used to calculate phase velocity;

5) Generation of the dispersion curve by combining calculated phase velocities for each shot location of a single MASW test; and

6) Generation of the stiffness profile, through forward iterative modelling and matching of model data to the field collected dispersion curve.

Processing of the MASW data was completed using the SeisImager/SW software package (Geometrics Inc.). The calculated phase velocities for a seismic shot point were combined and the dispersion curve generated by choosing the minimum phase velocity calculated for each frequency component as shown on Figure 2. Shear-wave velocity (V_s) profiles were generated through inverse modelling to best fit the calculated fundamental mode dispersion curves.

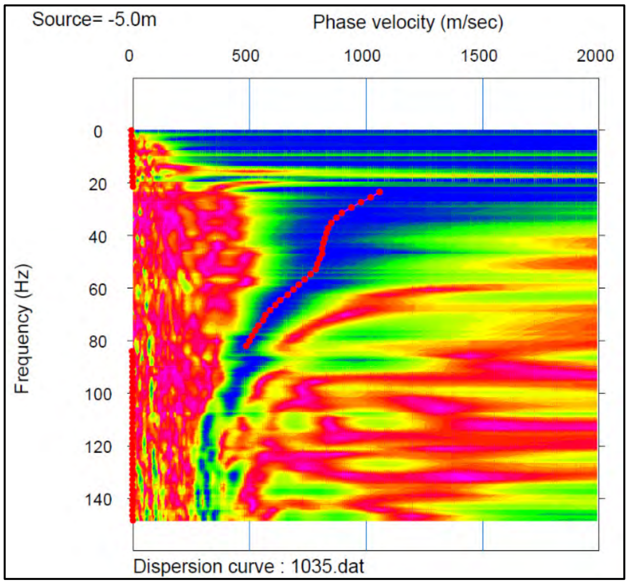


Figure 2: MASW Dispersion Curve Picks (red dots) for the MASW Line.

The minimum measured surface-wave frequency with sufficient signal-to-noise ratio to accurately measure phase velocity was approximately 25 Hz for the MASW Line.

Results

The MASW test results are presented on Figures 3, which present the calculated shear-wave velocity profile measured from the MASW Line. There is good correlation between the field collected and model calculated dispersion curves, with a root mean squared error of less than 5%.

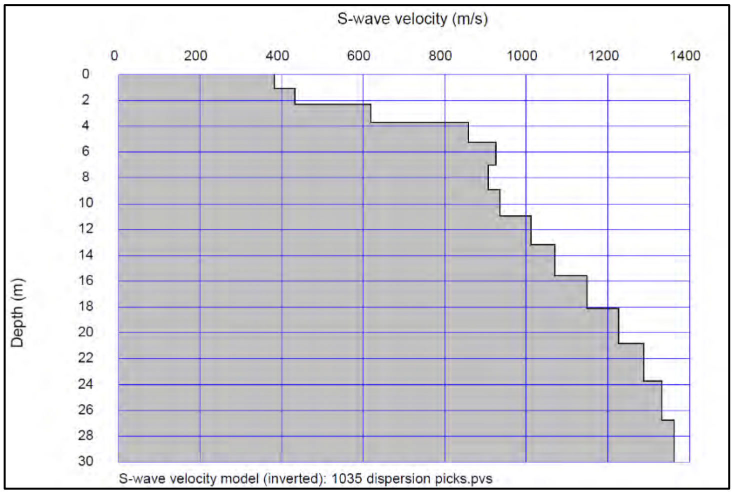


Figure 3: MASW Modelled Shear-Wave Velocity Depth profile for the MASW Line.

Table 1: Shear-Wave Velocity Profile MASW Line

Model Layer (mbgs)		Layer Thickness (m)	Shear Wave Velocity (m/s)	Shear Wave Travel Time Through Layer (s)
Top	Bottom			
0	1.1	1.1	380	0.002893
1.1	2.3	1.2	432	0.002780
2.3	3.7	1.4	623	0.002247
3.7	5.3	1.6	861	0.001857
5.3	7.0	1.7	928	0.001832
7.0	8.9	1.9	907	0.002095
8.9	11.0	2.1	937	0.002242
11.0	13.2	2.2	1012	0.002173
13.2	15.6	2.4	1073	0.002237
15.6	18.1	2.5	1153	0.002168
18.1	20.9	2.8	1231	0.002274
20.9	23.7	2.8	1294	0.002164
23.7	26.8	3.1	1338	0.002317
26.8	30.0	3.2	1368	0.002339
Vs Average to 30 mbgs (m/s)				949

To calculate the average shear-wave velocity as required by Seismic Site Classification, the results were modelled to 30 metres below ground surface (mbgs).

The time-averaged shear-wave velocity (Vs30) for the MASW Line was found to be 949 m/s (Table 1).

Closure

We trust that this technical memorandum meets your needs at the present time. If you have any questions or require clarification, please contact the undersigned at your convenience.

Golder Associates Ltd.

Alex Bilson Darko, MSc.
Geophysics Group

Christopher Phillips, MSc., PGeo
Senior Geophysicist, Principal

ABD/CRP

APPENDIX E

Hydraulic Conductivity Testing Results

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST 22-01

INTERVAL (metres below ground surface)

Top of Interval = 3.05
Bottom of Interval = 6.27

$$K = \frac{r_c^2 ln\left(\frac{R_e}{r_w}\right)}{2L_e}\frac{1}{t}ln\frac{y_0}{y_t}$$ where K=m/sec

where:

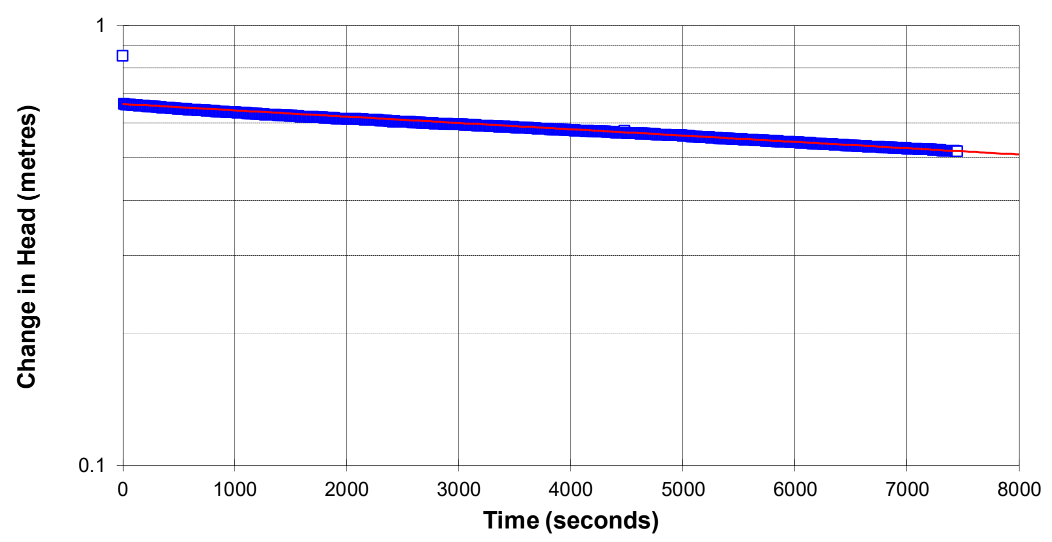
r_c = casing radius (metres);
R_e = effective radius (metres);
L_e = length of screened interval (metres);
r_w = radial distance to undisturbed aquifer (metres)
y_0 = initial drawdown (metres)
y_t = drawdown (metres) at time t (seconds)

INPUT PARAMETERS

r_c =	0.03
r_w =	0.05
L_e =	2.44
$ln(R_e/r_w)$	2.66
y_0 =	0.66
y_t =	0.52
t =	7430

RESULTS

K=	2E-08	m/sec
K=	2E-06	cm/sec



Project Name: Holland Cross
Project No.: 22530229
Test Date: 03-Oct-22

Analysis By: SPS
Checked By: CAMC
Analysis Date: 05-Oct-22

Golder Associates Ltd.

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST 22-02B

INTERVAL (metres below ground surface)

Top of Interval = 5.95
Bottom of Interval = 9.00

$$K = \frac{r_c^2}{2L_e} ln\left[\frac{L_e}{2R_e} + \sqrt{1 + \left(\frac{L_e}{2R_e}\right)^2}\right]\left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_2 - t_1)}\right]$$

where K = (m/sec)

where:

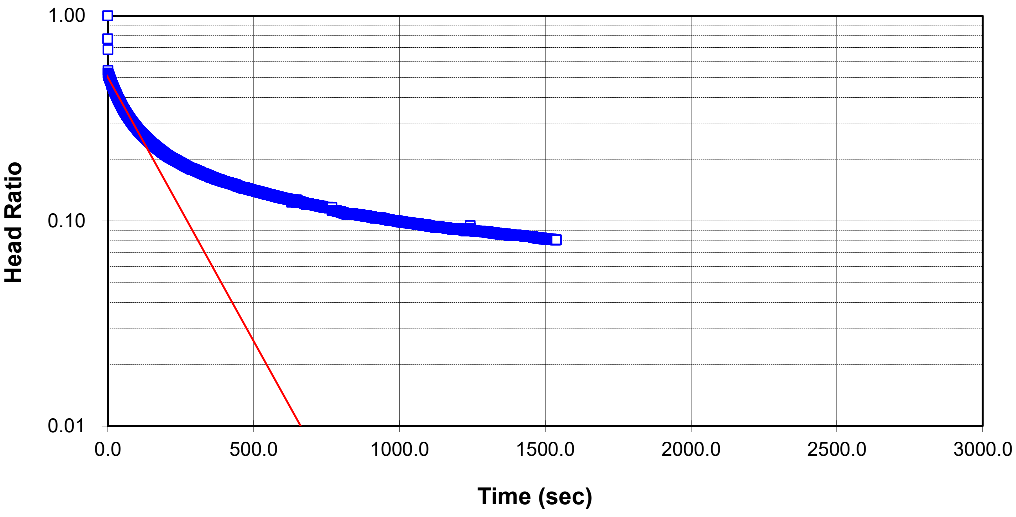
r_c = casing radius (metres)
R_e = filter pack radius (metres)
L_e = length of screened interval (metres)
t = time (seconds)
h_t = head at time t (metres)

INPUT PARAMETERS

r_c =	2.5E-02
R_e =	4.8E-02
L_e =	3.1
t_1 =	14.5
t_2 =	91
h_1/h_0 =	0.46
h_2/h_0 =	0.29

RESULTS

K=	3E-06	m/sec
K=	3E-04	cm/sec



Project Name:	Holland Cross	Analysis By:	SPS
Project No.:	22530229	Checked By:	CAMC
Test Date:	2022-10-03	Analysis Date:	2022-10-05

Golder Associates Ltd.

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST 22-03

INTERVAL (metres below ground surface)

Top of Interval = 5.95
Bottom of Interval = 9.00

$$K = \frac{r_c^2 ln\left(\frac{R_e}{r_w}\right)}{2L_e}\frac{1}{t}ln\frac{y_0}{y_t}$$ where K=m/sec

where:

r_c = casing radius (metres);

R_e = effective radius (metres);

L_e = length of screened interval (metres);

r_w = radial distance to undisturbed aquifer (metres)

y_0 = initial drawdown (metres)

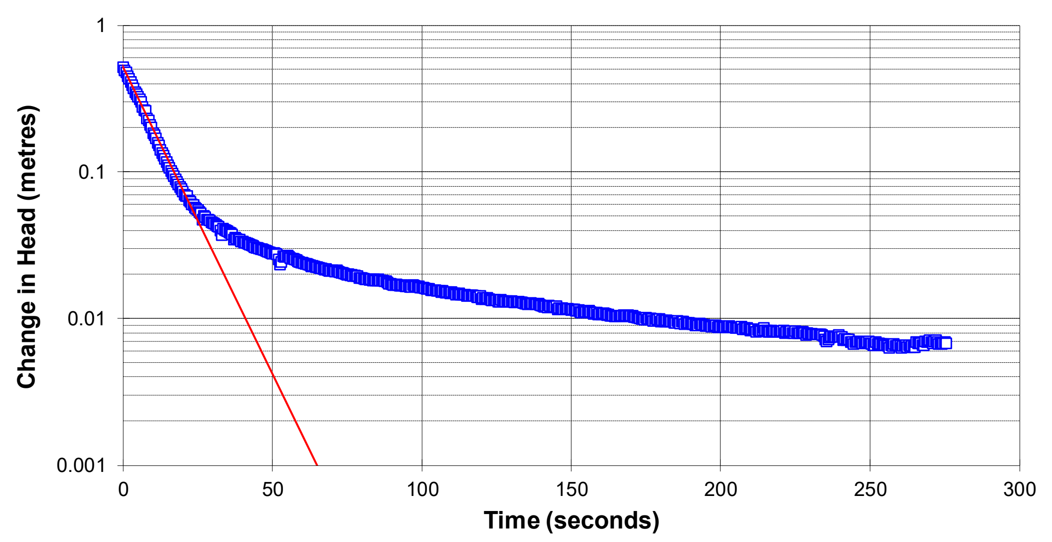
y_t = drawdown (metres) at time t (seconds)

INPUT PARAMETERS

r_c =	0.03
r_w =	0.05
L_e =	3.05
$ln(R_e/r_w)$	2.96
y_0 =	0.49
y_t =	0.06
t =	22

RESULTS

K=	5E-05	m/sec
K=	5E-03	cm/sec



Project Name: Holland Cross
Project No.: 22530229
Test Date: 03-Oct-22

Analysis By: SPS
Checked By: CAMC
Analysis Date: 05-Oct-22

Golder Associates Ltd.

Predicted Radius of Influence and Estimated Inflow - 1560 Scott Street

Dupuit-Forchheimer Equation: $Q=\pi K((h_o^2-h_p^2)/\ln(R/r))$

Groundwater Inflow

K (m/sec) 2E-05

h_0 (m) 5.6

h_p (m) 3.4

r (m) 23.0

r - Equivalent Radius

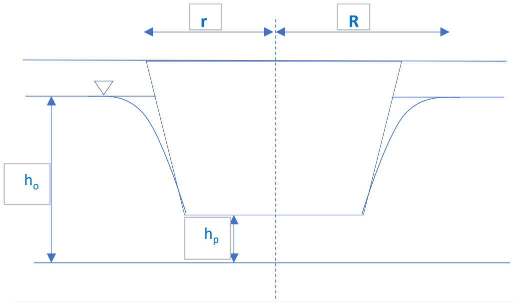
R - Radius of Influence

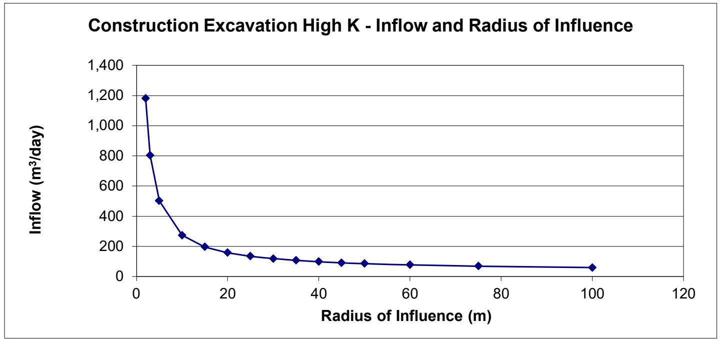
Equivalent radius of excavation

$A \times B=\pi r^2$

width of excavation A =	34	m
length of excavation B =	49	m
Area =	1,666	m^2
r =	23.0	**m**

	Q (m3/s)	R	Rad. of Inf. from edge	m^3/day	L/day
	1.4E-02	25.0	2	1,182	1,181,719
Initial	9.3E-03	26.0	3	804	803,667
	5.8E-03	28.0	5	501	500,875
	3.2E-03	33.0	10	273	272,896
	2.3E-03	38.0	15	196	196,204
	1.8E-03	43.0	20	157	157,434
	1.5E-03	48.0	25	134	133,889
Steady State	1.4E-03	53.0	30	118	117,992
	1.2E-03	58.0	35	106	106,488
	1.1E-03	63.0	40	98	97,747
	1.1E-03	68.0	45	91	90,858
	9.9E-04	73.0	50	85	85,275
	8.9E-04	83.0	60	77	76,741
	7.9E-04	98.0	75	68	67,943
	6.8E-04	123.0	100	59	58,732





Sichart and Kyrieleis Equation: $R=3000\Delta h(K^{1/2})$

Excavation Radius of Influence (m) = 28

Static groundwater elevation (m)	58.3	*highest water level (BH22-01)*
Elevation of bottom of excavation (m)	56.6	
Dewatered elevation (masl)	56.1	
Top of confining unit (masl)	52.7	*assumed at bottom of BH*

Rainfall Amount - Based on a 79.2 mm precipitation event in 24 hours with a return of 10 years (litres):

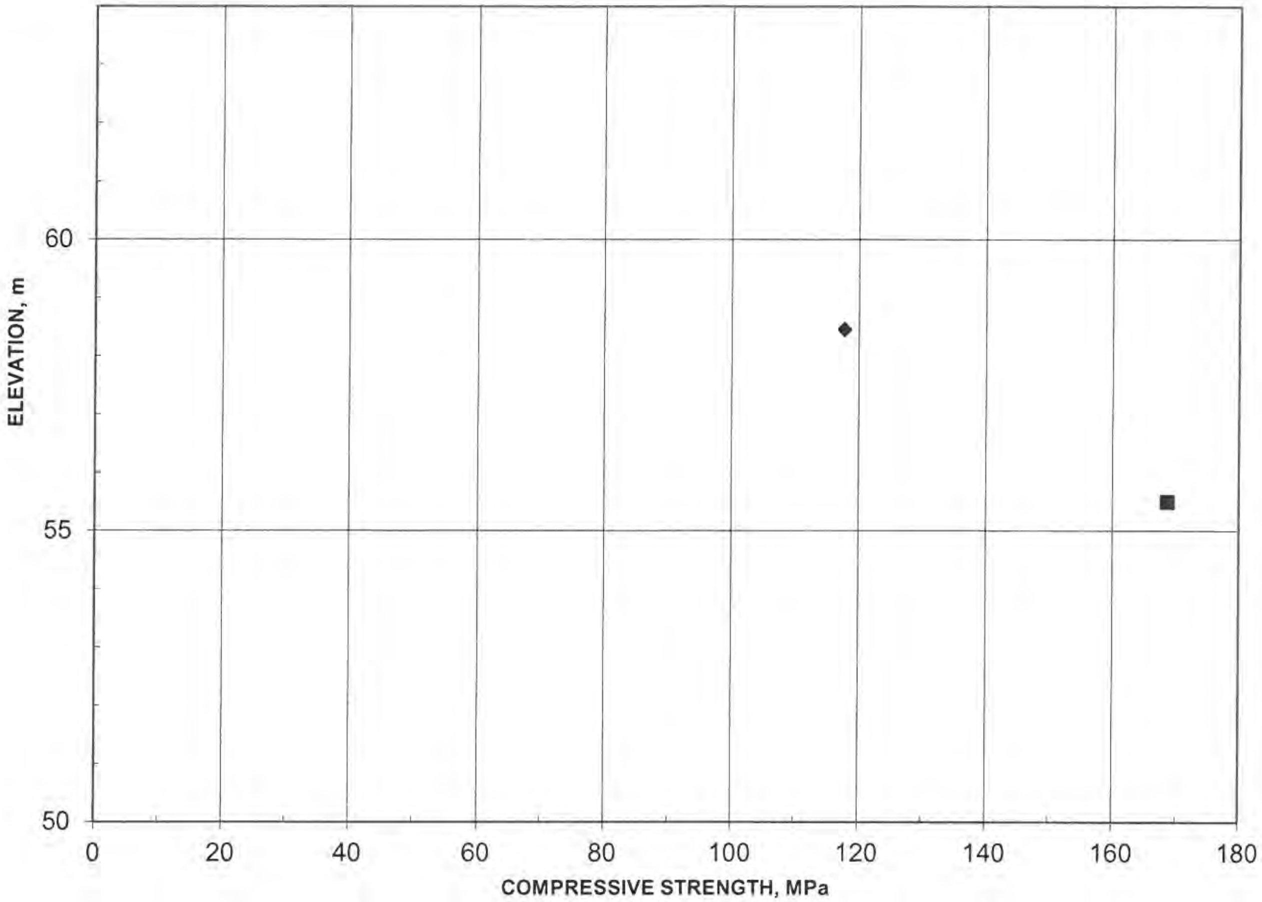
Precipitation (litres) = 131,947

APPENDIX F

Rock Photos and Results of UCS Testing

ASTM D7012 - Method C
UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORE
SUMMARY OF LABORATORY TEST RESULTS

FIGURE



	Borehole	Depth (m)	L/D	Bulk Density (kg/m^3)	Lithology	UCS (MPa)	Failure Type
■	BH22-02B RC1	6.2	2.5	2755	Limestone	169	1
◆	BH22-03 RC1	3.4	2.3	2688	Limestone	118	1

Notes:

Failure Types

1. Well formed cones on both ends
2. Well formed cones on one end, vertical cracks through cap
3. Columnar vertical craking through both ends
4. Diagonal fracture with no cracking through ends
5. Side fractures at top or bottom
6. Side fractures at both sides of top or bottom

Remarks

- Cores tested in vertical direction.
- Cores tested in air-dry condition.
- Time to failure > 2 and < 15 minutes.

Project: 22530229

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Checked by: JB

https://golderassociates.sharepoint.com/sites/35409g/Shared Documents/Active/2022/22530229/

BH22-01 (Dry)

Cored Length : 1.60 m to 6.27 m

Core Box 1 & 2

Cobbles and Bouldes from 1.37 to 1.60 m

Top of Rock @ 1.60 m

Bottom @ 6.27 m

wsp GOLDER

Geotechnical Investigation

1560 Scott Street

Ottawa, Ontario

Project No.	22530229
Drawn:	AKP
Date:	2022-10-11
Checked:	CH
Review:	

Multiple Cores

1 of 1

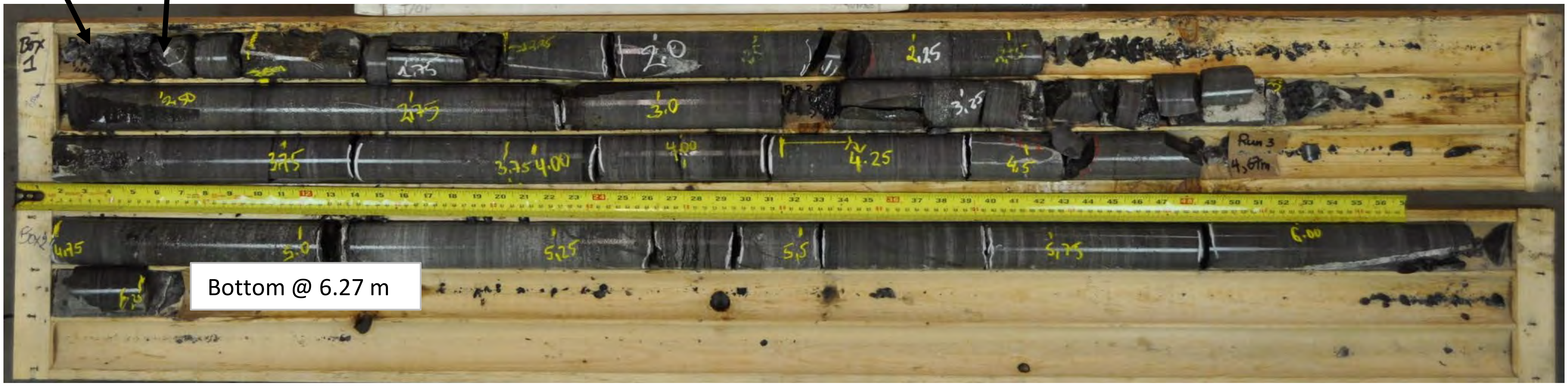
BH22-01 (Wet)

Cored Length : 1.60 m to 6.27 m

Core Box 1 & 2

Cobbles and Bouldes from 1.37 to 1.60 m

Top of Rock @ 1.60 m



Bottom @ 6.27 m

wsp GOLDER

Geotechnical Investigation

1560 Scott Street

Ottawa, Ontario

Project No.	22530229
Drawn:	AKP
Date:	2022-10-11
Checked:	CH
Review:	

Multiple Cores

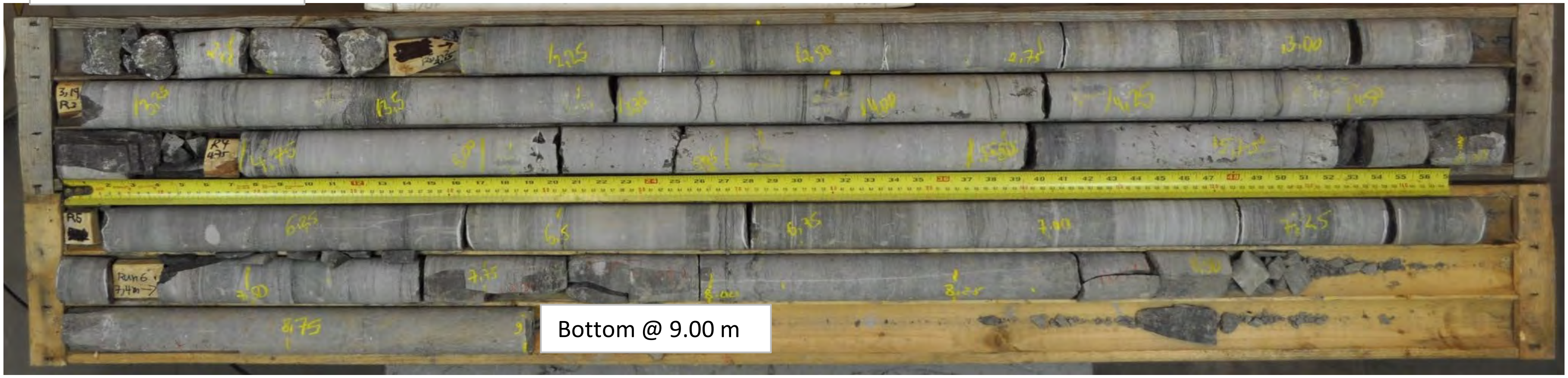
1 of 1

BH22-02B (Dry)

Cored Length : 1.85 m to 9.00 m

Core Box 1 & 2

Top of Rock @ 1.85 m



Bottom @ 9.00 m

Geotechnical Investigation

1560 Scott Street

Ottawa, Ontario

Project No.	22530229
Drawn:	AKP
Date:	2022-10-11
Checked:	CH
Review:	

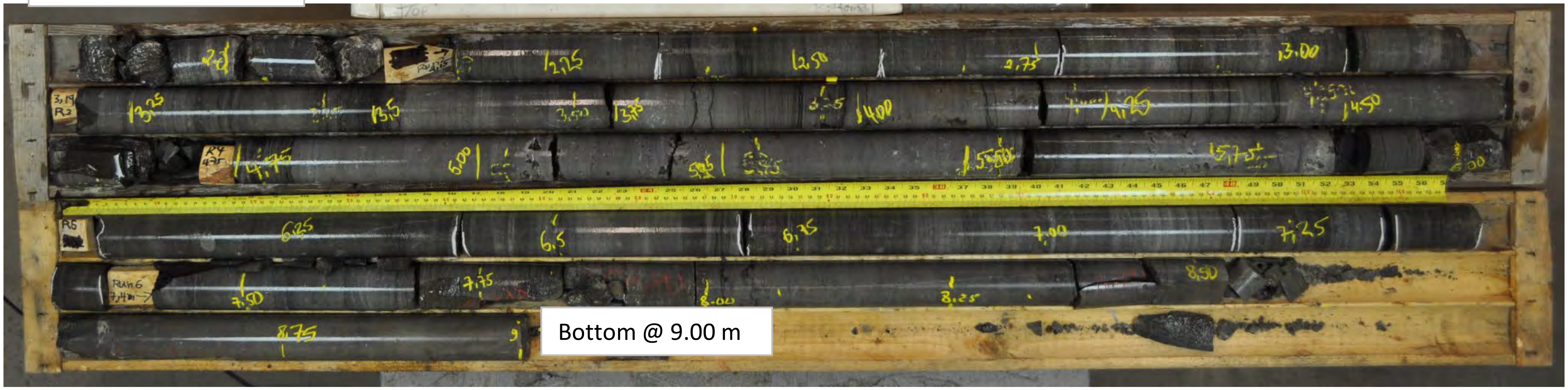
Multiple Cores
1 of 1

BH22-02B (Wet)

Cored Length : 1.85 m to 9.00 m

Core Box 1 & 2

Top of Rock @ 1.85 m



Bottom @ 9.00 m

WSP GOLDER

Geotechnical Investigation

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Ottawa, Ontario

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Review:	

Multiple Cores

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BH22-03 (Dry)

Cored Length : 1.52 m to 9.00 m

Core Box 1 & 2

Top of Rock @ 1.52 m

Bottom @ 9.00 m

Geotechnical Investigation

1560 Scott Street

Ottawa, Ontario

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Date:	2022-10-11
Checked:	CH
Review:	

Multiple Cores

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BH22-03 (Wet)

Cored Length : 1.52 m to 9.00 m

Core Box 1 & 2

Top of Rock @ 1.52 m

Bottom @ 9.00 m

WSP GOLDER	**Geotechnical Investigation** **1560 Scott Street** **Ottawa, Ontario**	Project No. 22530229 Drawn: AKP Date: 2022-10-11 Checked: CH Review:	**Multiple Cores** 1 of 1

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