

REPORT

Geotechnical Engineering Design Input Holland Cross Expansion

1560 Scott Street, Ottawa, Ontario

Submitted to:

Pomerleau

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Borehole and Test Pit Records Previous Investigation (McRostie Genest Middlemiss & Associates, Report No. SF-2687)



1.0 INTRODUCTION

Golder Associates Ltd. (Golder) previously carried out a geotechnical desktop review as part of a Site Plan Agreement application to the City of Ottawa for the proposed expansion to the Holland Cross facility, located at 1560 Scott Street in Ottawa, Ontario. The results of that desktop review were provided in the Golder report dated December 2013 (Report Number 13-1121-0176).

The purpose of that previous report was to assess the subsurface conditions at the site by means of review of existing geotechnical information and, based on an interpretation of the factual information available, to provide preliminary engineering input on the geotechnical design aspects of the project, including comments on construction considerations which could influence design decisions. The foundation engineering guidelines provided in that previous report were consistent with the procedures outlined in the 2006 Ontario Building Code (OBC). At that time, the proposed expansion consisted of development of a 12 storey low-rise building with two basement/below grade levels.

It is understood that the proposed building design has subsequently been modified to comprise a 23 storey building, also with two basement/below grade levels.

The purpose of this report is to provide updated geotechnical recommendations in accordance with the current 2012 OBC to reflect the changes in the proposed design.

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 BACKGROUND INFORMATION

2.1 Site and Project Descriptions

Consideration is being given to the design and construction of a 23 storey building to be located at 1560 Scott Street in Ottawa, Ontario (see Key Plan, Figure 1).

The following is known about the existing property:

- The proposed building will be located in the southeast corner of an overall site that is 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.
- The overall site measures about 140 m by 140 m in plan area and contains two 7 storey office buildings, one along the northern perimeter and one on the western perimeter border, and a 2 storey building in the southern part of the site. A single storey building covers most of the remainder of the site footprint.
- The existing facility in the area of the proposed 23 storey building consists of a low-rise building with two basement levels. These building areas will be demolished to allow for construction of the expansion.

The current development plans indicate:

- The proposed building footprint is identified on the Site Plan, see Figure 2.
- The proposed building will be 23 storeys in height and encompass a plan area of about 36 m by 47 m.
- Similar to the existing structure at the site, the proposed structure will have 2 basement/below-grade levels.

Additional details on finished floor slab levels were not available at the time of preparation of this report.

2.2 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 following reports were reviewed in the assessment of site conditions for this study, which include the investigations for the existing development:

- 1) 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).
- 2) Letter to Laurnic Investments by McRostie titled "*Holland and Spencer Avenues, Beech Foundry Site, Rock Elevations*" dated June 6, 1984 (Report No. SF-2481).
- 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).

Golder also previously carried Vertical Seismic Profiling (VSP) geophysical testing on a nearby Tunney's Pasture site for Public Works and Government Services Canada in 2011 and that information has also been reviewed in preparation of this report.

Based on the available information, the subsurface conditions are anticipated to consist surficial fill material overlying glacial till and then by bedrock with the bedrock surface located at depths varying from about 0.5 to 2.8 m below the original ground surface.

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

3.0 SUBSURFACE CONDITIONS

3.1 General

The approximate locations of the boreholes and test pits previously advanced at the site are identified on Figure 2. Relevant borehole and test pit records from the previous investigations by McRostie in the immediate vicinity of the proposed building are provided in Appendix A.

The following provides an overview of the subsurface conditions encountered in the test pits and boreholes previously advanced at the site followed by more detailed descriptions of the major soil strata and shallow groundwater conditions. It should be noted that the previous investigations pre-dated development of the site and, as such, the near surface conditions are anticipated to have been altered by the existing development (e.g., removal of materials to permit construction of the existing below-grade structures) including bedrock excavations.

In general, the subsurface conditions consist of up to approximately 2.8 m of surficial fill materials overlying limestone bedrock. Organic materials and/or glacial till deposits were present between the fill materials and bedrock at some locations on the site.

3.2 Surficial Fill Materials, Organic Material and Glacial Till

The records for the McRostie test pits and boreholes encountered a concrete slab at ground surface with a thickness ranging between about 60 to 150 mm in test pits numbered 2 to 11, inclusively. Topsoil was encountered in some test pits over the site ranging in thickness from about 200 to 300 mm. A layer of fill material was present underlying the concrete slab, topsoil or at surface, within or near the proposed building footprint; the fill extended to depths of up to about 2.3 m below the original ground surface (but was locally thinner). The past investigations generally describe the fill material as being comprised of a variety of materials including topsoil, sand, gravel, clay, bricks, wood, metal, concrete and other debris.

A 0.3 to 0.8 m thick organic layer was encountered at or near the proposed building footprint (i.e., in borehole 86-8 and at test pits N120/E120 and N150/E120) at depths of 0.40, 1.7 and 1.35 m below the ground surface, respectively.

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 most if not all of the above noted materials were removed during construction of the existing building.

3.3 Bedrock

The near surface materials described above are underlain by bedrock. Records for the McRostie boreholes indicate that limestone bedrock was encountered at depths ranging between 0.52 and 2.8 m below ground surface (Elevation 59.6 to 61.2 m) within the overall site. At test pits and boreholes advanced within or near the footprint of the proposed tower, the bedrock surface was encountered at elevations of about 59.8 to 61.0 m.

The upper portion of the rock was noted to be slightly weathered and soil filled seams within the bedrock were identified in the core drilling program.

3.4 Groundwater

The existing groundwater data indicates that, at least seasonally, the groundwater level was near ground surface. Groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring, and during and following periods of sustained precipitation.

However, it is noted that the groundwater levels at this site have likely been altered as a result of the existing development (e.g., current water levels are anticipated to be influenced by existing building drainage systems).

4.0 **DISCUSSION**

4.1 General

This section of the report provides preliminary engineering input on the geotechnical design aspects of the proposed development, based on our interpretation of available information described herein and the project requirements.

The foundation engineering guidelines presented in this section of the report have been developed in a manner consistent with the procedures outlined in 2012 OBC for Limit States Design.

4.2 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 also 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 new footing areas.

The available subsurface information suggests that the bedrock surface in the immediate vicinity of the proposed building was located at shallow depth (i.e., at depths ranging between about 1.6 and 2.5 m below ground surface at the time of the previous investigations). The founding levels for new building foundations are therefore expected to be within limestone bedrock.

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 <u>above the water table</u> 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.

Depending on the final excavation geometry, some shoring/temporary support may be needed for the excavation 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. However, the exposed bedrock should be inspected by qualified geotechnical personnel at the time of excavation to confirm this assessment.

Similarly, if/where the existing foundation walls are removed; vertical bedrock excavation walls are anticipated to be feasible.

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.

4.3 Foundations

It is understood that the proposed building will have two basement levels. It is expected that the excavation will extend about 1 to 2 m below the basement floor level to accommodate footing construction. At these levels, new building foundations are expected to be founded within limestone bedrock.

For initial assessment purposes, it is expected that footings founded on or within the competent limestone bedrock would be sized using an Ultimate Limit States (ULS) factored bearing resistance in the range of 2 to 4 MPa; additional site-specific investigation will be required prior to detailed design to further assess and optimize design bearing pressures.

Provided the bedrock surface is acceptably cleaned of loose or broken bedrock, the settlement of footings at the corresponding service (unfactored) load is considered negligible therefore the SLS condition will not govern the design.

The ultimate resistance of the footings to lateral loading may be calculated using an ULS friction value of 0.7 (unfactored) across the interface between the footing and the bedrock. If greater resistance is required, the footings could be provided with shear keys or prestressed rock anchors could be used to increase the normal stress level across the interface. Further guidance on this issue can be provided, if required.

The available information from previous investigations at the site typically does not include detailed descriptions of bedrock weathering conditions but did identify the presence of soil filled seams within the bedrock. Based on these conditions, it is recommended that probe holes (50 mm diameter drilled holes) be advanced within the footing areas to depths of about 2 m below founding level. These probe holes should be inspected by the geotechnical engineer and would be used to confirm that the weathered bedrock has been entirely removed and no soil filled seams are present beneath the footings. Contract drawings should include provision for making variations in footing sizes or founding elevations in the event that weathered or other poor quality rock or soil infilled seams are encountered.

4.4 Seismic Design

The seismic design provisions of the 2012 OBC depend, in part, on the shear wave velocity of the upper 30 m of soil and/or rock below founding level.

Site specific shear wave velocity profiling, using the Vertical Seismic Profiling (VSP) method (down-hole geophysical method), was carried out in a borehole on an adjacent Tunney's Pasture site for Public Works and Government Services Canada in 2011.

A review of the borehole information indicates that both sites are underlain by similar overburden conditions (i.e., less than about 1 m of fill material) and similar bedrock conditions (i.e., limestone of the Bobcaygeon Formation). The results of the nearby VSP testing would therefore also be applicable to this site as permitted by the OBC. The results of the VSP testing indicated an average shear-wave velocity for the bedrock of 2,200 m/s. As such, this site can be assigned a Seismic Site Class A.

4.5 Basement Floor 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 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 or where 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 percent of the material's Standard Proctor Maximum Dry Density (SPMDD).

4.6 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.

4.7 Basement Walls

The backfill and drainage requirements for basement walls, as well as the lateral earth pressures will depend on the type of excavation that is made to construct the basement levels.

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.

4.7.1 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 percent 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.

4.7.2 Excavations in Bedrock

Where basement walls will be poured against bedrock, vertical drainage such as Miradrain or equivalent must be installed on the face of the bedrock to provide the necessary drainage. The top edge of the vertical drainage should be sealed or covered with a geotextile to prevent the loss of soil into the void between the sheet and geotextile of the drainage system.

Where the basement walls will be constructed using formwork, it will be necessary to backfill a narrow gallery with free draining backfill between the shoring or bedrock face and the outside of the walls. The backfill should consist of 6 mm clear stone 'chip', placed by a stone slinger or chute.

In no case should the clear stone chip be placed in direct contact with other soils. For example, surface landscaping or backfill soils placed near the top of the clear stone back fill should be separated from the clear stone with a geotextile.

Both the drain pipe for the wall backfill and/or the drainage system should be connected to a perimeter drain at the base of the excavation which is connected to a sump pump.

4.7.3 Lateral Earth Pressures

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

- 1) Walls cast directly against the bedrock face.
- Walls cast against formwork with a narrow backfilled gallery provided between the basement wall and the adjacent excavation bedrock face.
- 3) Walls cast against formwork with a wide backfilled gallery provided between the basement wall and the adjacent excavation face.

For Case 1 there will be no effective lateral earth pressures on the basement wall under static conditions.

For Case 2, 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/m³ 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 3, the basement walls should be designed to resist lateral earth pressures calculated as:

 $\sigma_h(z) = K_0 (\gamma z + q)$

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/m³;

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 3, 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:

 $\sigma_h(z) = K_o \gamma z + (K_{AE} - K_A) \gamma (H-z);$ 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.

4.8 Impacts on Adjacent Development

Possible impacts on adjacent developments could result from:

- Ground movement around the perimeter of the excavation.
- 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 excavation (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, the excavation 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.

Temporary and permanent groundwater level lowering would be an issue with regards to surrounding ground settlements if sensitive and compressible clay soils exist within the expected zone of influence of the groundwater level lowering (both during construction and in the long term due to the foundation drainage system). It is noted that the lowest level of the new structure is expected to be at or close to the lowest level of the existing structure; therefore, provided similar drainage systems are used for the new building, the construction of this building is not anticipated to result in a significant permanent groundwater lowering compared to existing conditions. Furthermore, the review of information from investigations at and nearby the site as well as published geologic mapping does not indicate that compressible soils are present near this zone. Based on these conditions, groundwater level lowering will not be an issue with regards to ground settlements due to overstressing sensitive and compressible clay soils.

4.9 Environmental Considerations

The site is located in an area of the City that is known to contain contaminated groundwater; therefore, the development of deep excavations or the installation of dewatering systems that could cause substantial changes to groundwater flow patterns (either during construction or in the long term) should be avoided.

5.0 ADDITIONAL CONSIDERATIONS

Additional site specific investigation will be required prior to finalising the design of the building in order to more accurately assess the bedrock characteristics immediately beneath the building footprint; this information would be used as input to geotechnical aspects of detailed design (e.g., confirming design bearing pressures for foundations, providing information for use in assessing rock anchors that could be required to resist seismic loading, etc.).

All footing and subgrade areas should be inspected by experienced geotechnical personnel prior to filling or concreting to ensure that bedrock having adequate bearing capacity has been reached and that the bearing surfaces have been properly prepared. The placing and compaction of any engineered fill should be inspected to ensure that the materials used conform to the specifications from both a grading and compaction viewpoint.

Pumping from the excavation will result in groundwater flow from the surrounding properties towards this site. Therefore, groundwater contamination beneath adjacent properties, if present, could be drawn towards this site. If any such pumping is planned, additional chemical testing should be carried out prior to construction to determine the groundwater quality so that disposal requirements can be confirmed. The inflow of contaminated groundwater during construction could result in increased groundwater disposal costs.

At the time of the writing of this report, only preliminary details for the proposed development were available. Golder should be retained to review the detailed drawings and specifications for this project prior to tendering to ensure that the guidelines in this report have been adequately interpreted.

6.0 CLOSURE

We trust this report meets with your current requirements. If you have any questions regarding this report, please contact the undersigned.

Golder Associates Ltd.



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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, **Pomerleau.** 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.

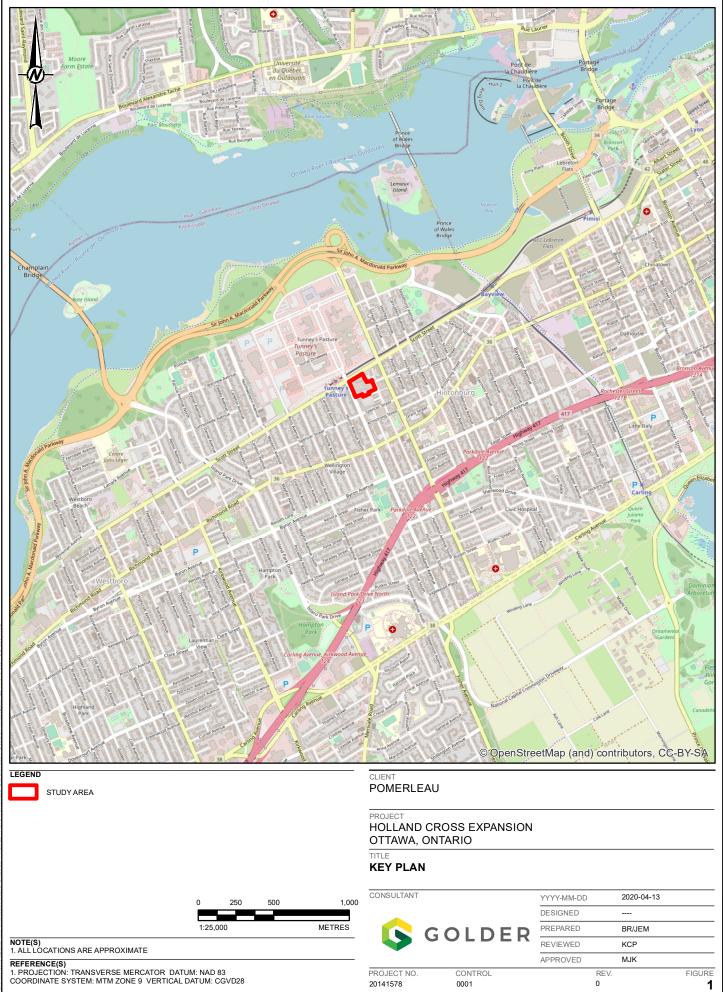
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater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

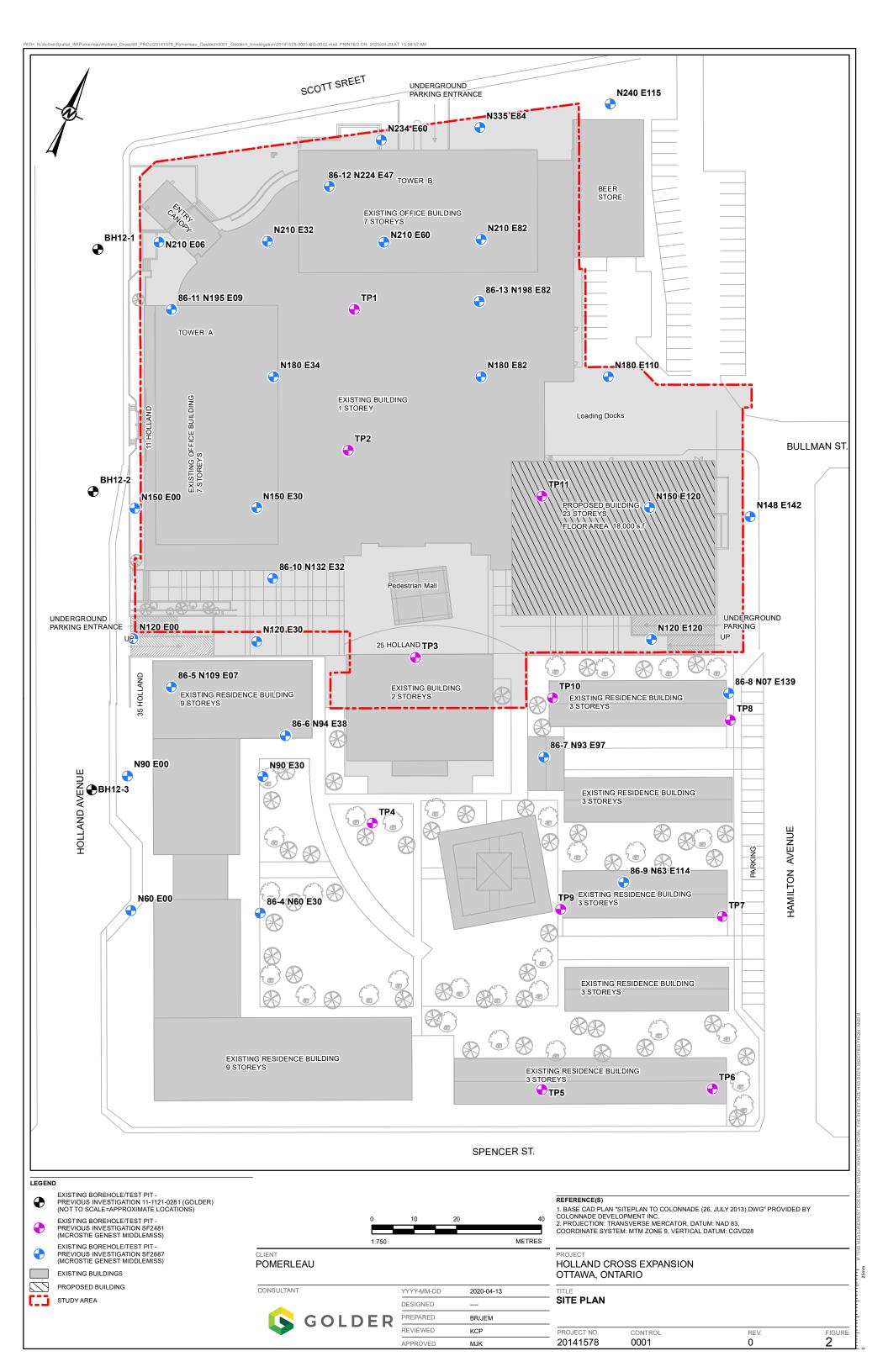
Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

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.



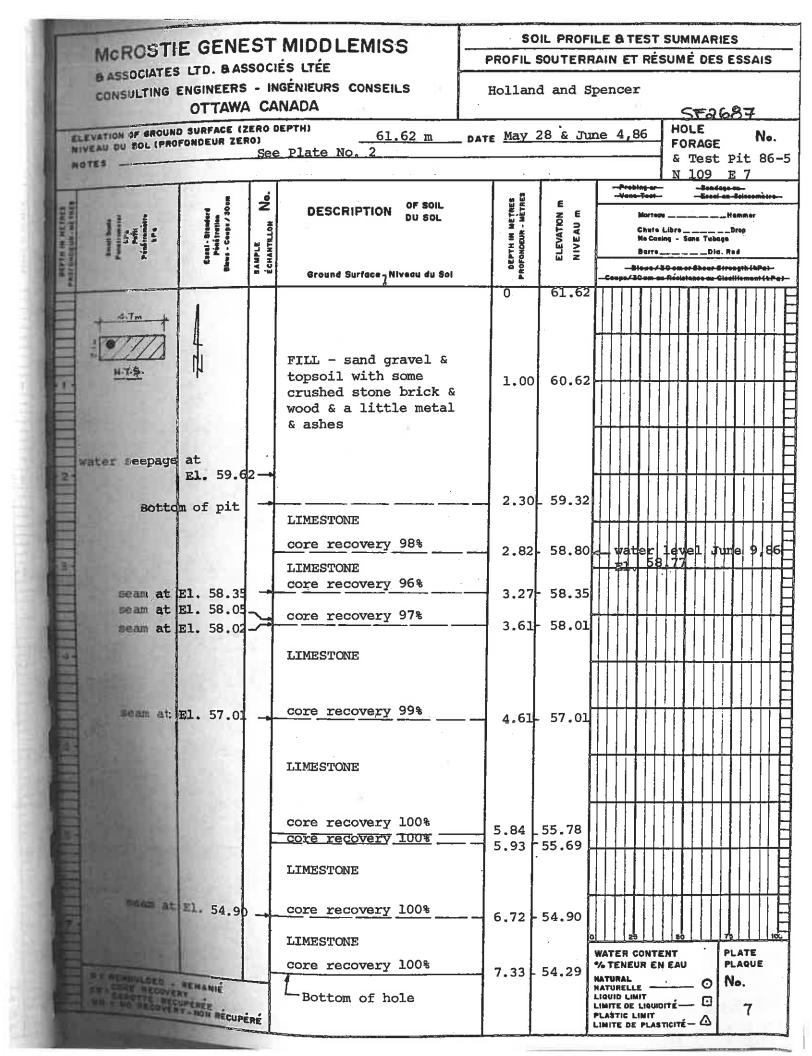


APPENDIX A

Borehole and Test Pit Records Previous Investigation (McRostie Genest Middlemiss & Associates Ltd., Report No. SF-2687)

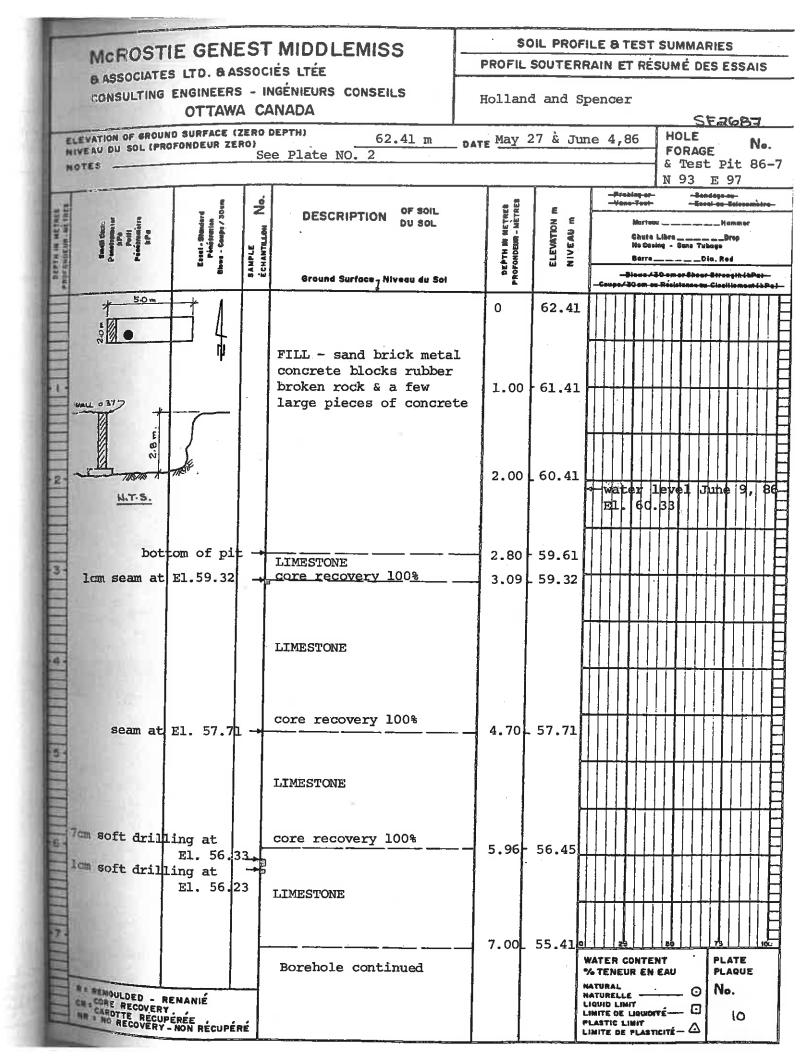
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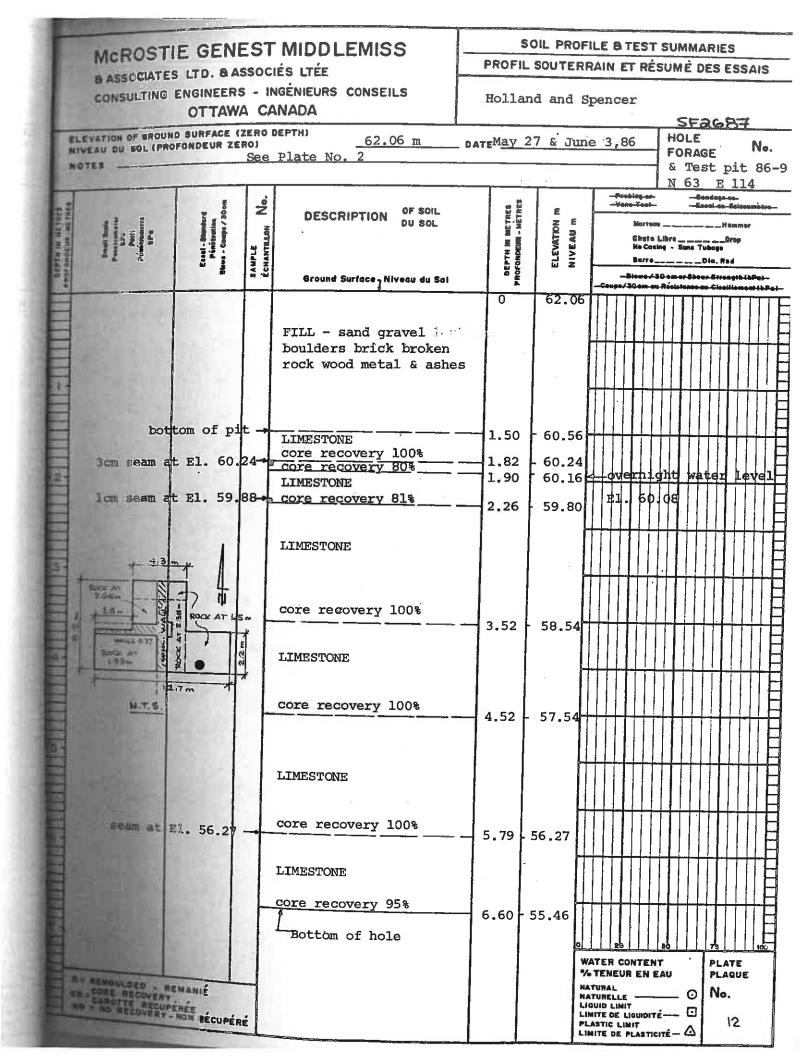


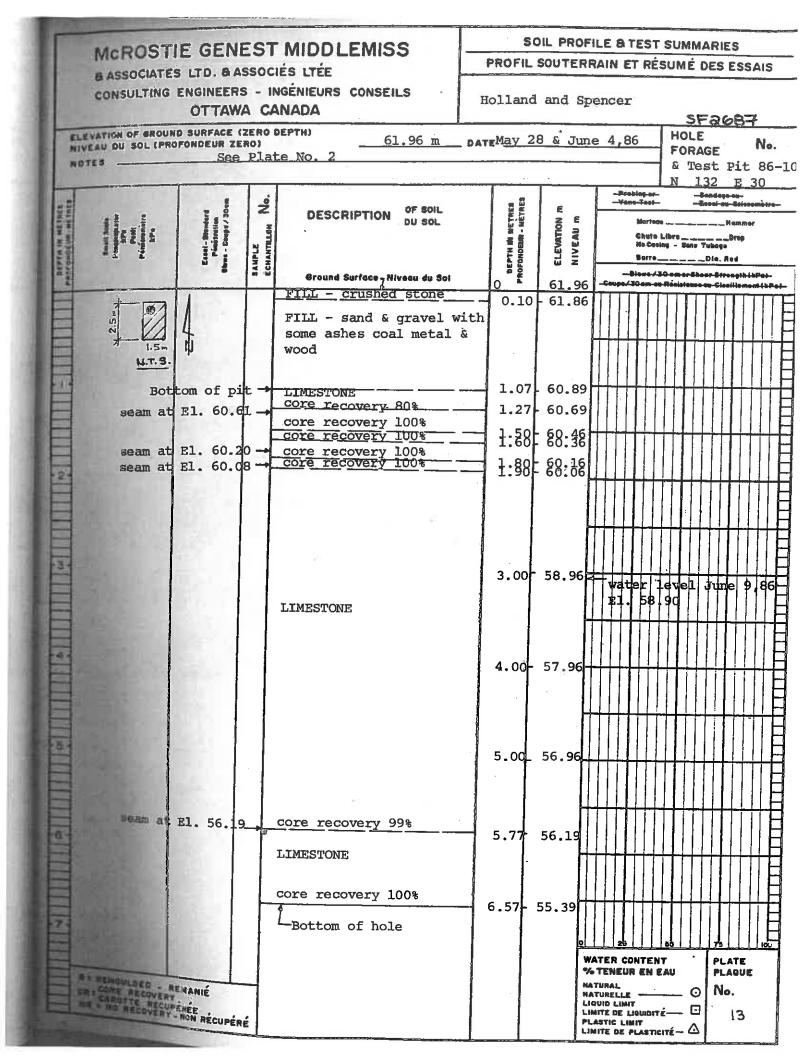
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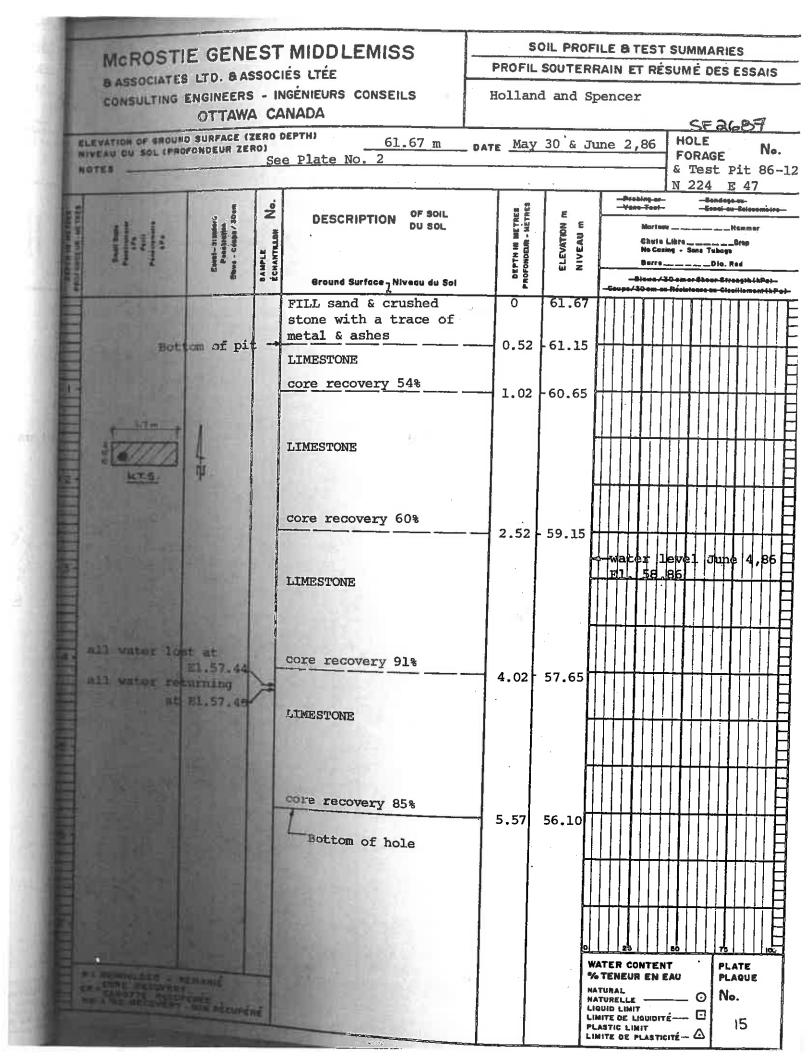


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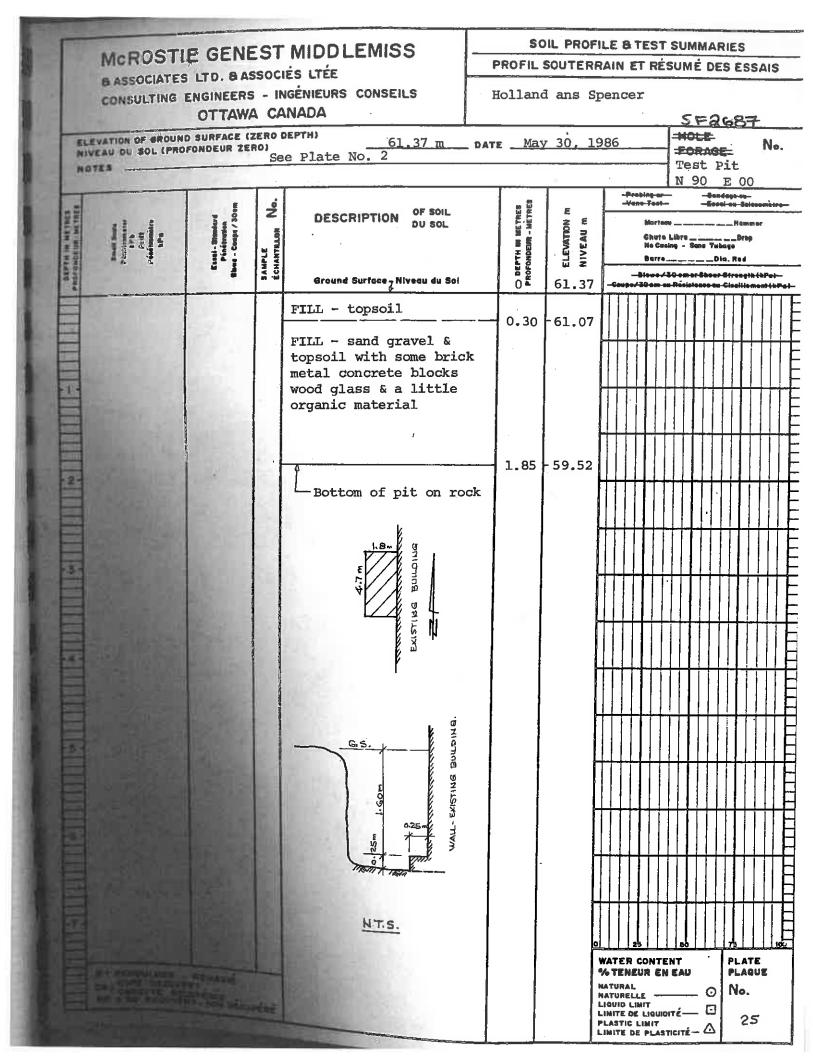


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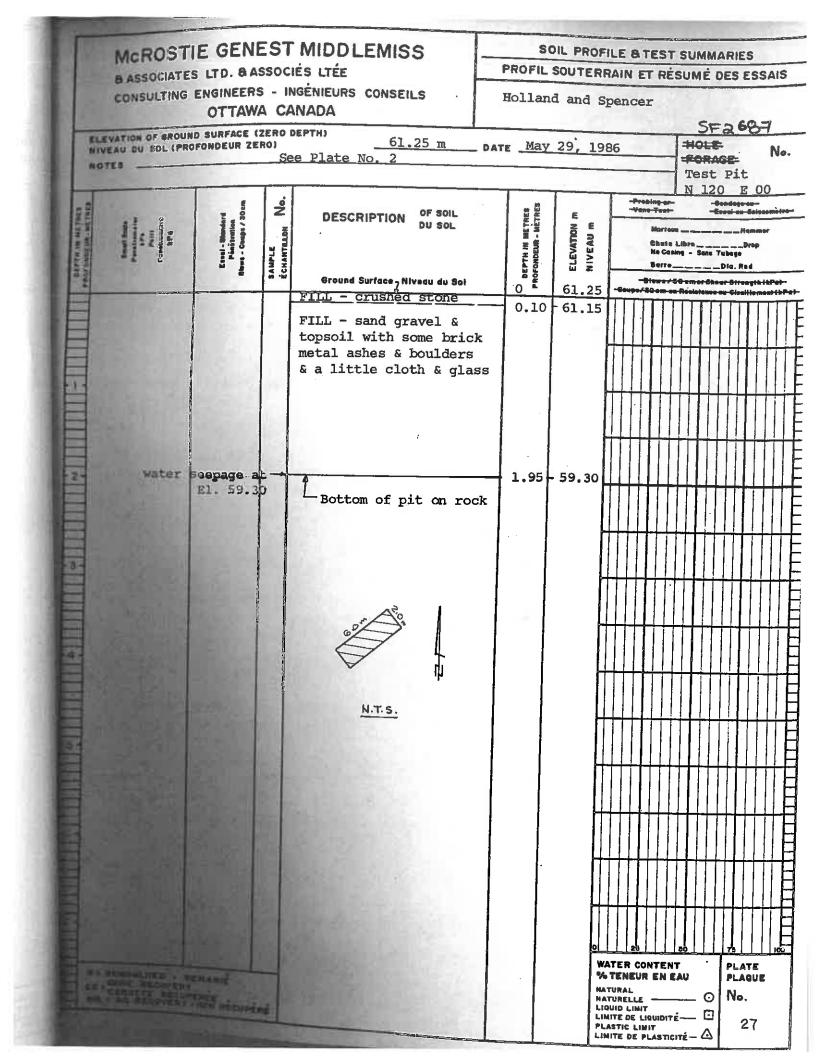


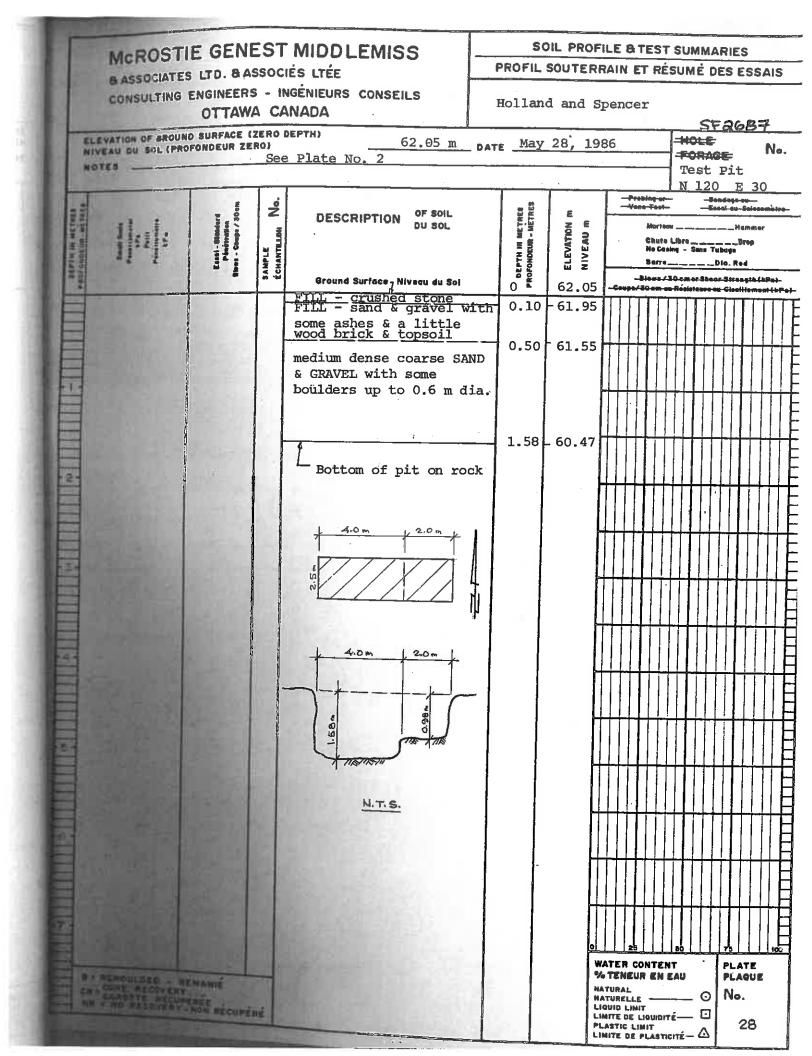
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	FILL - topsoil	0 61.73	n on Résistance au Ciseille ment (bPa)-					
Bottom of pit	FILL - sand & gravel w a trace of ashes & met		1evel June 9,86					
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				FILL - sand & organic material with some ash		0	61.91			
-	water at 1	-1 60 71		brick broken rock & boulders						
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				FILL - sand & clay with some wood brick & concrete	h					
	water see	page at E1, 60.5	4	ORGANIC material	- 1.70	- 60.54				
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-	N-1 TRANSPORT	·····	$\left \begin{array}{c} \\ \\ \end{array} \right $	Ground Surface ₇ Niveau du Sol F1LL - Crushed stone	0.10	<u>61.74</u> 61.64	-Coups/20am a	Tieletense av	
-				FILL - sand gravel & topsoil with some brick	- 0.10	- 01.04			
				& ashes & a little metal & glass					
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n - M DR=00 NA -	ANDULOES - BEN ONT RECOVERY AMOUNT RECOVERY	Anië Se nécurén	6			9% NA LIC LIC PL	ATER CONTEN TENEUR EN E TURAL TURELLE	AU () [()	PLATE PLAQUE No. 31	

F	B ASSOCIATE	S LTD. BAS	SOCI	MIDDLEMISS	SO PROFIL S	IL PROFI	LE & TEST	SUMM/	ARIES DES ESSAIS	
		OTTAW	A CA		Holland			SI	=2687	
BUN	EVATION OF EROUN	FONDEUR ZEI	See	61.50 m 0/ Plate No. 2	ATE May	26, 198	6	Tes	t Pit	•
PTH IN METHER Distriction and The h	A LEASE AND A LEAS	Eseti - Standerd Pésétemiten Diens - Coop. / 300m	sample échantillen No.	DESCRIPTION OF SOIL DU SOL	BEPTH IN METRES PROFONDEUR - MÈTRES	ELEVATION m NIVEAU m				
10.00			4 U 8 U	Bround Surface ₇ Niveau du Sot	P P P		-Bloss-A	10-sm or the	er Strength (kPa)	
	ater scepage	at		FILL - topsoil sand gravel bricks & pieces of wood	0	61.50				
2	ater scepag	El. 60.2		ORGANIC material L Bottom of pit on roc	1.60	60.25 59.95				
				S.C.						
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AN DO INDEED										<u> </u>
57	REMODULDED - AN CORE ASCONTRY CUADTTE ROCUP - NO REZOVERY -	(Manié Mér nicorén	-			NAT NAT LIQU LIM PLA	TER CONTEN TENEUR EN I URAL UTELLE UID LIMIT ITE DE LIGUIDIT ITE DE PLASTIC	ί Αυ ⊙ έ ⊡	PLATE PLAQUE No. 32	

Γ	McROSTI	E GEN	EST	MIDDLEMISS				LE A TEST			· · · ·
	B ASSOCIATES	LTD. 8A	SSOCI S - IN	IÉS LTÉE IGÉNIEURS CONSEILS		-	and Sp	AIN ET RÉ encer			15
NIV	TATION OF SROUND	D SURFACE (ZERO		DATE	May	29, 19	86	HOLE FORM Test	Pit (Vo.
Fr					Т			Probing or-		0 E 15	
N METRES		East- Standard Pánáireitun Bhus - Coupe / 30m	No. No.	DESCRIPTION DU SOL		O DEPTH IN METRES PROFONDEUR - METRES	ELEVATION M NIVEAU M	Chute		Hammer	• i * • •
NOTE L	41 1		SAMPLE ÉCHANTILLÓN			E PTH	ELEV	Barre,		Dia. Red	
4 0 4			1 · · ·	ALOUND SALIDCA J MIAADA CA 201			61.67	-Biews/3 -Coupe/30cm at		u Cleaillement	
				FILL - crushed stone FILL - topsoil & sand with some broken rock		0.10	61.57				
1.				ashes metal & glass		1.80	60.87				
			·	Bottom of pit on rock	k						
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H I	ADMOULOED - A CORE RECOVERY CAROTYE RECOVERY	EHANIÉ ERÉE MON RÉCUPÉ	,TE				NA NA Lii Lii Pl	ATER CONTEN TURAL TURELLE TURELLE AUTO LIMIT MITE DE LIQUIDIT ASTIC LIMIT AITE DE PLASTI	EAU © ré E	PLATE PLAQUE No. 33	

		MCROSTI		EST		S	OIL PROF	ILE & TEST	SUMM	ARIES	
		CONSULTING E	OTTAW	S - 11 A C/	NGÉNIEURS CONSEILS			pencer		a687	
1	NIV	EAU DU SOL (PROP	SURFACE (RUI	62.37 m Plate No. 2	DATE May	28, 19	86	HOLE FORM Test	e N GE N Pit	lo.
1000	A IN WEITHER	1 62 6	Elasi - Standard Pánětrajion Blava - Caupu / 30om	SAMPLE ÉCHANTELON No.	DESCRIPTION OF SOIL DU SOL	DEPTH IM METRES Rofondeur - METRES	ELEVATION m NIVEAU m	Ghute		80 E 30 Iondage au Innel de Tolscomè Hammor Brop	
	REP 14	+1 2	1×1	SAMPLE ÉCHANTI	Ground Surface ₇ Niveau du Sol	DEPTH Rofowd	NIN	Borre.			
	-				FILL - crushed stone	0	62.37	-Coupe/30 em a	Résistance	au Ciseillement (*Pe)
					FILL - sand gravel & topsoil with some ashes brick broken rock metal & wood Bottom of pit on rock N.T. 5.		1 14				
	All a	Charles and a series of the se	n akcuréa	ŧ			944 111 111 111	TURELLE		№. 34	

- A A A	BASSOCIATES CONSULTING E	LTD. 8 A	SSOC 5 - II A CA	IGÉNIEURS CONSEILS		SOUTERR	IL E & TEST RAIN ET RÉ encer	SUMĖ D		5
NI	EVITION OF GROUND LEAU DU SOL (PROP TES	SURFACE (KO1	ee Plate No. 2	ATE May	<u>30, 198</u>	6	-HOLE FORM Test	Pit No	
The IN METHON		Esset-Shundard Páiobailan Bhus - Caupe / 30 am	SAMPLE ÉCHANTALON NO.	DESCRIPTION OF SOIL DU SOL	D BETTH W WETTRES	ELEVATION M NIVEAU M	Chuta No Car	-81		H
Pant		- 5	9 Ai	Ground Surface , Niveau du Sai	PROF	<u>61.7</u> 3	Biewer	10 em er Eken	r Strength (hPa) s Cissiliement (h	- -
				FILL - topsoil FILL - fine sand with a little metal & brick Bottom of pit on rock <u>y</u> <u>y</u> <u>N.T.5.</u>	0.70					
1111	REWOILDED . AT COPY BECOMENT CARDITE RECUP TER RECORDERT.	twanié twře non akcuré	né			NA NA LII LII PL	TENEUR EN : TURAL ATURELLE QUID LIMIT MITE DE LIQUIDI ASTIC LIMIT MITE DE PLASTI	0 ré 10	PLAQUE No. 35	

MCROSTIE GENEST MIDDLEMISS

CONSULTING ENGINEERS - INGENIEURS CONSEILS

BASSOCIATES LTD. BASSOCIES LTEE

SOIL PROFILE & TEST SUMMARIES

PROFIL SOUTERRAIN ET RÉSUME DES ESSAIS

Holland ans Spencer

OTTAWA CANADA SF26B7 ELEVATION OF GROUND SURFACE (ZERO DEPTH) HOLE NIVEAU (NU SOL (PROFONDEUR ZERO) 62.06 m ___ DATE May 29, 1986 No. FORAGE. See Plate No. 2 NOTES Test Pit N 180 E 110 -Brebl -Send å DEPTH IN METRES PROFONDEUR - METRES Mana Tant MC TRUE Essel - Standard Pánátrakian Bibwa - Coups / 30on Sec.1 HUTHER OF SOIL DESCRIPTION ε E DU SOL ELEVATION SAMPLE ÉCHANTILLON Marteau ____Hemmer NIVEAU 263 Chuta Libre No Casing - Sans Tubaya z _Drop Barra____Dia, Red Blows / 30 cm or Shear Strength (bPa)-Ground Surface, Niveau du Sol 0 62.06 430 n Ch FILL - topsoil 0.25 61.81 FILL - fine sand 0.50 -61.56 TOPSOIL 0.58 100se coarse SAND & 61.48 GRAVEL 0.90 - 61.16 medium dense sandy TILL with a few boulders up to 0.45 m dia. water seepage at . EL 59.95 2.30 59.76 -Bottom of pit on rock N.T.S. WATER CONTENT PLATE ST STREET, - STREET, % TENEUR EN EAU PLAQUE NATURAL No. - 0 NATURELLE -LIQUID LIMIT _ 🖸 LIMITE DE LIQUIDITE 36 PLASTIC LIMIT LINITE DE PLASTICITÉ -

MICROSTI			MIDDLEMISS -			ILE & TEST		
CONSULTING E	ENGINEERS	s - IN A CA	IGÉNIEURS CONSEILS	Holland				2687
ELEVATION OF GROUND HIVE NU DU SOL (PROF NOTES) SURFACE (Fondeur Ze	NOT	Gl.14 m DA	TE May	29, 198	36	-HOLE -FORM Test	No.
	Essel - Standard Péaésesta Bbws - Coops / 30 cm	LLON No.	DESCRIPTION OF SOIL DU SOL	l NETRES R - NETRES	ELEVATION m NIVEAU m	Chate		ndege eu- sel an Seissemètre- Hammer Drie
11.1	Essal-	SAMPLE ÉCHANTILLON	Bround Surface Niveau du Sol	O DEPTH MI	NIVEAU 01.14	Borre Borre	ling - Sane Ty f 30-marSkee	ipaða
			<u>FILL - crushed stone</u> FILL - sand & gravel wit some ashes broken rock brick & metal	- F	- 61.04			
			Bottom of pit on rock	1.00	60.14			
	57	e	1.3m					
			in Q in the second seco					
			<u>ы.т. s.</u>					
		10000						
A + RENFLATED + 1 CA - CONC ALCOVER CA - CONC ALCOVER NN / KO ALCOVER NN / KO ALCOVER	REMARKE ANDE NETWO	tai			9 N/ Li Li	ATER CONTE ATURAL ATURAL ATURAL IQUID LIMIT IMITE DE LIQUID LASTIC LIMIT IMITE DE PLAST	EAU	PLATE PLAQUE No. 37

	MCROSTI B ASSOCIATES	E GENI	EST ssoci	MIDDLEMISS	PR	SO OFIL S	IL PROFI	ILE & TEST RAIN ET RÉ	SUMMA	RIES ES ESSAIS
	CONSULTING E	OTTAW	s - In A ca	IGÈNIEURS CONSEILS	Но	lland	l and S	pencer		2687
ELE NIV NOT	ATION OF BROUND AU DU SOL (PROF	SURFACE C	HV1	<u>62.38</u> ee Plate No. 2	DATE	May 2	8, 198	6	Test	HE No.
CUR METRES	isiii	Essel-Strandord Pénébration Bitens - Coapy / 30 cm	SAMPLE ÉCHANTREON NO.	DESCRIPTION OF SOL		DEPTH III HETRES PROFONDEUR - HÉTRES	ELEVATION M NIVEAU M	Chute Ne Car	Libra	ndage au- ent se Salassmètre
PAGFOND	*t t		SAMPLE Échanti	Ground Surface ₇ Niveau du Sol		PROFON	62.38	-Biene/	30 em or Shoe 5 Résistance a	Dia, Rod Ir Strongth (LPa) 4 Cisalliomaat (LP
				FILL - topsoil			- 62.08			
				FILL - sand & gravel with some broken rock brick metal wood glass						
				& topsoil						
2		4.				L.80	60,58			
				- Bottom of pit on ro	ck					
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R (2	REMONILIED - A CORE RECOVERY GANGTER MECOVERY	ENAMIÉ MARE - NON RÉCUS	-					WATER CONTE % TENEUR EN NATURAL LIGUID LIMIT LIMITE DE LIGUID PLASTIC LIMIT DIMITE DE PLAST	0	

	S LTD. & A ENGINEERS OTTAW	SSO	NGÉNIEURS CONSEILS	Hollan	d and sp	Dencer	SUMMARIES SUMÉ DES ESSAIS SF2687
NOTES	FONDEUR ZE	RO)	<u>61.73 m</u> Plate No. 2	DATE Ma	<u>y 30, 19</u>	86	Test Pit
Perfection in any parts provide the angle of the second se	Earal - Annadord Pianitreation Bloos - Compa / 30 cm	SAMPLE ÉCHANTILLON NO.	DESCRIPTION OF SOIL DU SOL Ground Surface 7 Niveau du Soi	O DEPTH IN NETRES PROFONDEUR - NETRES	ELEVATION IN NIVEAU IN	Chute Ne Gas	N 210 E 60
		5	FILL - topsoil FILL - till with a trace of brick & metal Bottom of pit on rock N.T.S.	0.47	-61.48 -61.26 -60.87		
A = HEMOULDED - HEMU CB = CORC ARTOVERY DATE OF CONCENT	ARGUPERE				% TER NATUR NATUR LIQUID LIMITE		_ O No.

8 AS CONS	SOCIATES	NGINEER	SSOC S - II A C/ ZERO	DEPTHI	Hollan	SOUTERF	pencer	UMĖ DES ESSAI	IS
NOTES _	SOL (PROP		Se	61.82 m DA	TE May	30, 198		Test Pit	le.
REFERENCE ALTERE	ų:	Earst - Standord Pérébration Blove - Coape / 30 cm	SAMPLE ÉCHANTILION NO.	DESCRIPTION OF SOIL DU SOL	O DEPTH IN METRICS PROFONDEUR - METRICS	ELEVATION M NIVEAU M	Probling-as- Vano-Tays- Marrow Chura Lib Ho Casing Barro Bioro / 200	N 210 E 82 -Bondage-au- Ersel as Balanser Mammer ''sDrop - Sans Tubage Dia. Rod Dia. Rod 	
				FILL - topsoil FILL - medium sand with a piece of concrete pipe & a trace of metal Bottom of pit on rock <u>bottom of pit on rock</u> <u>N.T.S.</u>		- 61.62 60.72			

ſ	B ASSOCIA	TES LTD. 8A	SSOC	MIDDLEMISS	F	SC	UL PROFI	LE & TEST	SUMN SUMÉ	ARIES DES ESSAI	IS
	CONSULTIN	G ENGINEER	s - II	NGÉNIEURS CONSEILS			and Sp				
NIX	EVATION OF JRO	UND SURFACE (Profondeur Ze	ROJ	рертн) <u>61.71 m</u> e Plate No. 2	DATE	May	30, 1980	5	-NOL	AGE: N	lo.
H								-Probing of	N23	t Pit 4 E 60	
N METHER	lsils	Beneficial Beneficial Beneficial	Lon No.	DESCRIPTION OF SOIL DU SOL		METRES 1 - METRES	E NOL	-Vine-Test-		Sondage au- Essai es Scissomà — — Ham mor	vire-
0127794 10	11	Esst-Bunderd Paniorothin Bans - Coupe / 30	SAMPLE Échamtadh	Ground Surface ₇ Niveau du Soi		O DEPTH IN A	ELEVATION NIVEAU m	Barro_		Dig Red	
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				FILL - topsoil & sand with a trace of metal brick & ashes			ļ				
				L Bottom of pit on rock	k	0.75	60.96				
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F	McROST 6 ASSOCIATE			MIDDLEMISS -	S	DIL PROF	ILE & TEST	SUMMARIES	
	CONSULTING	ENGINEER: OTTAW	S - II A CA	NGÉNIEURS CONSEILS	Holland			SFace	
NSA	EVATION OF GROU TEAU OU SOL (PR	ND SURFACE (RO)	62.17 m 0	ATE May	30, 198	6	HOLE FORAGE Test Pit N 235 E	Nø.
LIN IN METHER		Etail-Shankerd Findination Nives - Coops / 30 cm	sample échantilion No.	DESCRIPTION OF SOL	O DEPTH IN METRES PROFONDEUM - METRES	ELEVATION M Niveau m		- Bandana	soomètre
PASSFUL			SAMPLE Échanti	Ground Surface 7 Nivecu du Sol	O DEPT	∃ ¥ 62.17	Berre_	— Dia. Red 10 em er Skeur Strangel Rösistunge av Gleviller	
				FILL - topsoil FILL - sand gravel & topsoil with a trace of brick & metal Bottom of pit on rock <u></u> <u>N.T.S.</u>		61.07			
AL BU	CHURLOND . BE BRE RECOVERT HD RECUVERY	Namié née min mécuréné				% T NATU NATU LIQUI LIMIT PLAS	ER CONTENT ENEUR EN EA RAL RELLE D LIMIT E DE LIQUIDITÉ- TIC LIMIT E DE PLASTICIT	U PLAQUE O No. 0 42	

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	CONSULTING	ENGINEERS	i – I	IGENIEURS CONSEILS	Ho	llan	d and Sj	pencer			-	
		OTTAW				_				2687	_	
EN	LEVATION OF SROUN	OFONDEUR ZE	RUJ .	62.11 m	DATE	May	30, 198	36	-HOLE No.			
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		E	No.	OFFCOIDTION OF SOIL		5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	E	-Probing or- Vane Test-	-#1	indege og		
11.00-1	11, 1;	02 / see		DESCRIPTION DU SOL		O DEPTH IN METRES PROFONDEURI - METRES	ZE		4	Hemmer		
PT 4 18	11.1.	East - the Péadre	SAMPLE Échantrilon			PTH NG ONDEUR	ELEVATION NIVEAU m	Ho Ces	ing - Sans Ti	npade		
PROF			8 A	Ground Surface ₇ Niveau du Sol		D DE	62.11	Biere/i	là em er Sheer Strazyth (4Pe) Résistance au Clasifiement (4Pe)			
				FILL - topsoil		0.20	61.91		TTT		E	
				FILL - sand & gravel wit some ashes brick wood	5h							
				metal asphalt & glass								
-					- I	0.95	61.16		┽┼╂┼┼		-	
				boulders up to 0.6 m dia in dense sandy TILL	2.						=	
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Holland and Spencer Avenues, Beech Foundry Site, Rock Elevations

McRostie Genest Middlemiss

June 6, 1984

(Report No. SF-2481)

McROS	STIE GEN	VEST	M	IDDLEMISS			PROFILE & TE					
& ASSOC	IATES LTD	. & .	ASSO	CIÉS LTÉE	PRC	FIL SOL	JTERRAIN ET F	RÉSUMÉ	DES ESS	AIS		
CONSUL				NGÉNIEURS CONSEILS			SPENCER	57.				
FLEVATI				ANADA	_				SF 248	31		
NIVEAU D	U SOL (PRO	FOND	EUR	CE (ZERO DEPTH) 20. ZERO)			DATE MAY 16		HOLE-	No		
GYROSCO	E BLDG	AT	Seen	C CITY OF ATTAWA PLATE ON A	KDA	LE ISA	Y AICER		TEST. PIT			
S. T.		Essai - Standard Pepetration	No.	DUG BY TRACE MOUNTED SHOWE DESCRIPTION OF SOIL DU SOL	10.0		-PROBING OR	E6:	SAL AU MOU	LINE		
Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit K/Pd.2	- Star	illon		Depth in Fe Profondeur - F	E levation Niveau	MARTEAUHAMMER NO CASING SANS TUBAGE CHUTE LIBREDROP BARREDIA, ROI					
Stren Ren Kos	Pens K	Essai Pedel	Sample Echantillon	Ground Surface - Niveau du Sot	Depth	ч.й Ш	BLOWS/FOOT OF		TANCE AU, K/PD.2			
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& ASSOCIATES L	TD. & ASS	SOC	IÉS LTEE	PROP	IL SOU	TERRA	IN ET	RÉSUMÉ	DES E
			GÉNIEURS CONSEILS		51	ENCO	e K	57.	
		-	NADA						SFJ
NIVEAU DU SOL (ROFONDEU		E (ZERO DEPTH) 20 ERO) SEE PLATE No.2	3.9		DATE	MAY 10	84	FORA
		-			_		BINC OR		TEST
S.F. Ce d Ze ion Ze ion	2 2 midard tion oups /	No.	DESCRIPTION OF SOIL	Pied	e .	-**	AUH	66	SAI AU NO CA
Compressive Strength K.S.F. Résistence à la Compression K/Pd.2 Saull Scale Penetrometer K.S.F. Petit	Penetrometre K/Pds2 Essai - Syandard Blows/fts-Coups/pd Sample	Echantillon		Depth in Feet Profondeur - Pied	E levation Niveau	CHUTE	LIBRE	DROP BA	RRE
Strer Strer	Esaci Esaci Blows A	Echan	Ground Surface – Niveau du Sol	Profor	u z	-BLOWS	/FOOT O	R SHEAR :	ANCE A
		-	CONCRETTS SLAG	0.2'	203.9		1		
			- FILL-						
			SAND WITH						
			Some CLAY						
-		+	METAL, BRICK		-				
			ASHES & WOOD.						
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MCRU & ASSOC	State of the second	ATES LTD.		IDDLEMISS	PRO		PROFILE & TEST SUM JTERRAIN ET RÉSUMÉ	
CONSUL		ING ENGINE	ERS – I	NGÉNIEURS CONSEILS			NCER ST.	
ELEVATI	ELEVATION	OTTAW		ANADA CE (ZERO DEPTH)	07.5	<u></u>	11001	SF2481
NIVEAU I	NIVEAU DU			CE (ZERO DEPTH) 20 ZERO) SEE PLATE No.2	22.0		DATE MAY 16, 1984	I OKAGE II
			2		1	1	PROBING-OR-	TEST PIT 3
r Coulors of Coulors o	Compressive Strength K.S.F. Résistance à le Compression S-oll Scolo	Panetro Scere Pertrometer R.S.F. Pertro K/Pd.2 Essai-Stondard	HCoups/p	DESCRIPTION OF SOIL DU SOL	Depth in Feet Profondeur - Pied	Elevation Niveau	WARTEAUHAMMER CHUTE LIBREDROP	SAL AU MOULINET
1º Con See 2000	Streng Streng Rési Rési		Blows/ttC Sample Echantillon	Ground Surface – Niveau du S	Dept	₽ Z W	BLOWS/FOOT OR SHEAR	
				CONCRETE SLAB		203.3	CISATE	EEMENT
				-FILL- SAND & GRAVEL WITH SOME WOOD, M		-		
				BRICK & BROKEN LOCK	1.5	- 202.0		
				DENSE				
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