



**Geotechnical Investigation
Proposed Addition to Residential Building
330 McLeod Street
Ottawa, Ontario**

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Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation recently completed for the proposed addition to the residential building located at 330 McLeod Street, Ottawa, Ontario (Figure 1). Terms and conditions of this assignment were outlined in EXP's proposal number: P91297EN dated March 12, 2021 and was authorized by the Smart Living Properties (the client) on March 15, 2021.

It is our understanding that plans call for the design and construction of an addition to the existing five (5) story residential building located on the site. The proposed new building addition will be constructed on the south side of the existing building. It is our understanding that the existing building has a basement with the basement floor at 0.9 m depth below existing grade and the existing building is supported by footings founded at a 1.4 m depth below existing grade. The new building addition will also be five (5) stories with a basement floor at the same depth as the existing building; 0.9 m depth below existing grade. Since the site is located in a well-established developed area of the city of Ottawa, raising the site grades at the site is not anticipated for this project.

The fieldwork for the geotechnical investigation was completed on March 19 and 22, 2021 and consists of two (2) boreholes (Borehole Nos. 21-1 and 21-2). The boreholes were advanced to termination and cone refusal depths of 7.0 m and 21.7 m, respectively. The borehole fieldwork was supervised on a full-time basis by a representative from EXP.

A 32 mm diameter monitoring well (with screened section) was installed in both boreholes for long-term monitoring of the groundwater level.

The investigation revealed that the site is underlain by fill to depths of 1.8 m and 2.3 m below existing grade (Elevation 68.4 m and Elevation 67.8 m) followed by native stiff to very stiff clay. Based on the dynamic cone penetration test (DCPT) results from Borehole No.21-1, cone refusal was met on inferred boulders or bedrock at a 21.7 m depth (Elevation 48.5 m). The site is underlain by limestone bedrock of the Ottawa or Eastview formations.

The groundwater level is at 2.4 m and 3.5 m below the existing ground surface (Elevation 67.8 m and Elevation 66.7 m).

Based on the borehole information and Table 4.1.8.4.A in the 2012 Ontario Building Code (as amended May 2, 2019), the site classification for seismic site response is **Class D** and the subsurface soils are not susceptible to liquefaction during a seismic event.

Since the site is located in a well-established developed area of the city of Ottawa, raising the grades at the site is not anticipated as part of the proposed development. Therefore, the geotechnical engineering comments and recommendations provided in the report are based on the assumption that there will be no raise in the site grades for this project.

The proposed building addition may be supported by a strip footing having a maximum width of 1.5 m and square pad footings having a maximum width and length of 2.0 m founded on the surface of the undisturbed native clay contacted at approximately 1.8 m and 2.3 m depths (Elevation 68.4 m and Elevation 67.8 m). The footings may be designed for a bearing pressure at serviceability limit state (SLS) of 150 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 210 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. The recommended SLS and factored ULS values are valid provided the footings are set on the top of the native undisturbed clay and that there is no site grade raise as part of this development. Should the footings

extend to depths below the surface of the native clay, EXP should be contacted to review and provide updated SLS and factored ULS values for the footings.

The total and differential settlements of footings designed in accordance with the recommendations of this report and with careful attention to construction detail are expected to be less than 25 mm and 19 mm respectively.

The basement floor of the proposed building addition may be designed as a slab-on-grade set on the native clay or on a minimum 300 mm thick engineered fill pad placed on the native clay and should consist of Ontario Provincial Standard Specification (OPSS) Granular B Type II compacted to 98 percent standard Proctor maximum dry density (SPMDD). The floor slab should be set on a bed of well-packed 19 mm clear stone at least 200 mm thick placed on the engineered fill or native clay. The clear stone would prevent the capillary rise of moisture from the sub-soil to the floor slab. Adequate saw cuts should be provided in the floor slab to control cracking. A perimeter drainage system should be installed around the proposed new building addition. An underfloor drainage system is not required for the proposed building addition. If the perimeter drainage system of the existing building is encountered during the construction of the new building addition, it should be reinstated following construction of the new building addition.

It is anticipated that excavations may be undertaken using conventional equipment capable of removing cobbles, boulders and construction debris within the fill (such as concrete pieces). All excavation work should be completed in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. As per OHSA, the sidewalls of open cut excavations undertaken within Type 3 soil, must be sloped back at 1H:1V from the bottom of the excavation. Within zones of persistent seepage, the excavation side slopes are expected to slough and eventually stabilize at 2H:1V to 3H:1V from the bottom of the excavation.

If side slopes cannot be achieved due to space restrictions, such as the proximity of the excavation to neighboring structures (existing buildings) and infrastructure, the excavation for the proposed new building addition would have to be undertaken within the confines of an engineered support system (shoring system).

Seepage of the surface and subsurface water into these excavations is anticipated. However, it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. In areas of high infiltration or in areas where more permeable soil layers may exist, a higher seepage rate should be anticipated and may require high-capacity pumps to keep the excavation dry.

It is anticipated that the majority of the material required for underfloor fill and backfilling purposes would have to be imported and should preferably conform to Ontario Provincial Standard Specification (OPSS) Granular B Type II inside the proposed new building addition and against foundation walls and OPSS Select Subgrade Material (SSM) in service trenches outside the proposed new building addition and for exterior subgrade fill.

The above and other related considerations are discussed in greater detail in the attached report.

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation recently completed for the proposed addition to the residential building located at 330 McLeod Street, Ottawa, Ontario (Figure 1). Terms and conditions of this assignment were outlined in EXP's proposal number: P91297EN dated March 12, 2021 and was authorized by the Smart Living Properties (the client) on March 15, 2021.

It is our understanding that plans call for the design and construction of an addition to the existing five (5) story residential building located on the site. The proposed new building addition will be constructed on the south side of the existing building. It is our understanding that the existing building has a basement with the basement floor at 0.9 m depth below existing grade and the existing building is supported by footings founded at a 1.4 m depth below existing grade. The new building addition will also be five (5) stories with a basement floor at the same depth as the existing building; 0.9 m depth below existing grade. Since the site is located in a well-established developed area of the city of Ottawa, raising the grades at the site is not anticipated for this project.

This geotechnical investigation was undertaken to:

- a) Establish the subsurface soil and groundwater conditions at the two (2) boreholes located on the site,
- b) Provide classification of the site for seismic design in accordance with requirements of the 2012 Ontario Building Code (OBC) as amended May 2, 2019 and assess the liquefaction potential of the subsurface soils in a seismic event,
- c) Discuss grade raise restrictions,
- d) Provide the bearing pressure at Serviceability Limit State (SLS) and factored geotechnical resistance at Ultimate Limit State (ULS) of the most suitable type of foundation for the proposed building addition, as well as anticipated total and differential settlements,
- e) Discuss lateral earth pressure against subsurface walls,
- f) Comment on slab-on-grade construction and permanent drainage requirements,
- g) Discuss excavation conditions and dewatering requirements during construction of the foundations for the proposed building additions,
- h) Comment on backfilling requirements and suitability of the on-site soils for backfilling purposes; and
- i) Comment on subsurface concrete requirements and the corrosion potential of subsurface soils to buried metal structures/members.

The comments and recommendations given in this report assume that the above-described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The results of this review may be a modification of our recommendations or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The property is located in a well-established developed area of the city of Ottawa on the south side of McLeod Street between Bank Street and O'Connor Street. The site for the proposed building addition is currently occupied by an outdoor parking lot and shed with mature trees in the south portion of the site.

The neighboring properties on the east and west sides of the site are occupied by existing multi-story buildings and by an outdoor parking lot along the south side of the site.

The property is relatively flat with approximate ground surface elevations of Elevation 70.1 m and Elevation 70.2 m at the borehole locations.

3. Procedure

The fieldwork for the geotechnical investigation was completed on March 19 and 22, 2021 and consists of two (2) boreholes (Borehole Nos. 21-1 and 21-2). The boreholes were advanced to termination and cone refusal depths of 7.0 m and 21.7 m, respectively. The borehole fieldwork was supervised on a full-time basis by a representative from EXP.

The locations of the boreholes were established on site by EXP. The geodetic ground surface elevation at the borehole locations was estimated from the spot elevations shown on the topographic survey plan dated July 28, 2021 and prepared by Annis, O’Sullivan, Vollebekk Ltd. Therefore, the elevations presented in this report should be considered approximate. The borehole locations are shown in Figure 2.

Prior to the fieldwork, the locations of the boreholes were cleared of any public and private underground services. The boreholes were drilled using a track-mounted drill rig operated by a drilling specialist subcontracted to EXP. Standard penetration tests (SPTs) were performed in both boreholes at 0.75 m and 1.6 m depth intervals and the soil samples were retrieved by the split-barrel sampler. The undrained shear strength of the cohesive soil was measured by conducting penetrometer and in-situ vane tests. A dynamic cone penetration test (DCPT) was conducted in Borehole 21-1 from a 7.0 m depth to a cone refusal depth of 21.7 m below existing grade.

A 32 mm diameter monitoring well (with screened section) was installed in both boreholes for long-term monitoring of the groundwater level. The monitoring well was installed in accordance with EXP standard practice and the installation configuration is documented on the respective borehole log. The boreholes were backfilled upon completion of drilling and the installation of the monitoring well.

All soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified. On completion of the fieldwork, all the soil samples were transported to the EXP laboratory in Ottawa where they were visually examined by a geotechnical engineer and the borehole logs were prepared. The engineer also assigned the laboratory testing which consisted of performing the following tests on the soil samples:

Natural Moisture Content	11 Tests
Natural Unit Weights.....	2 Tests
Grain Size Analysis.....	3 Tests
Atterberg Limits.....	2 Tests
Chemical Analysis (pH, sulphate, chloride and resistivity)	1 Test

4. Subsurface Soil and Groundwater Conditions

A detailed description of the geotechnical conditions encountered in the boreholes is given on the borehole logs, Figures 3 and 4. The borehole logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the locations where sampling was conducted. The passage of time may also result in changes in the conditions interpreted to exist at the locations where sampling was conducted.

The boreholes were drilled to provide representation of subsurface conditions as part of a geotechnical exploration program and are not intended to provide evidence of environmental conditions.

It should be noted that the soil boundaries indicated on the borehole logs are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The “Notes on Sample Descriptions” preceding the borehole logs forms an integral part of this report and should be read in conjunction with this report.

A review of the borehole logs indicates the following subsurface soil conditions with depth and groundwater level measurements.

4.1 Fill and Buried Topsoil Layer

Fill was contacted at ground surface in both boreholes and extends to approximate depths of 1.8 m and 2.3 m below existing grade (Elevation 68.4 m and Elevation 67.8 m). The fill material in Borehole No. 21-1 comprises of sand with gravel, cobbles and boulders and concrete debris. A 150 mm thick topsoil layer is buried within the fill at a 0.7 m depth (Elevation 69.5 m). In Borehole No. 21-2, the fill consists of sand with gravel that grades to a silty clayey sand with gravel below the 1.5 m depth (Elevation 68.6 m). The fill material is in a very loose to compact state as indicated by the SPT N-values of 2 to 18 and has a natural moisture content ranging from 11 percent to 25 percent. The natural unit weight of the fill is 20.4 kN/m³.

Grain size analysis was conducted on one (1) sample of the fill and the grain size distribution curve is shown in Figure 5. The test results are summarized in Table I.

Borehole No.: Sample No.	Depth (m)	Grain-size Analysis (%)				Soil Classification (USCS)
		Gravel	Sand	Silt	Clay	
BH21-2: SS3	1.5 – 2.1	31	42	16	11	Silty Clayey Sand with Gravel (SC-SM)

Based on the results of the grain size analysis, the fill may be classified as a silty clayey sand with gravel (SC-SM) in accordance with the Unified Soil Classification System (USCS).

4.2 Clay (CH)

The fill in both boreholes is underlain by clay which extends to the sampling termination depth of 7.0 m below ground surface (Elevation 63.2 m and Elevation 63.1 m). The clay contains silt layers. The clay has a stiff to very stiff consistency as indicated by the undrained shear strength measurements of 58 kPa to 86 kPa from in-situ vane tests and 144 kPa from a penetrometer test. The clay is medium sensitive to sensitive based on sensitivity values of 3.1 to 6.0. The clay has a natural moisture content ranging from 36 percent to 77 percent. The natural unit weight of the clay is 17.9 kN/m³.

Grain size analysis and Atterberg Limits were conducted on two (2) samples of the clay and the grain size distribution curves are shown in Figures 6 and 7. The test results are summarized in Table II.

Table II: Summary of Results from Grain-Size Analysis and Atterberg Limits - Clay Samples									
Borehole (BH) No.: Sample (SS) No.	Depth (m)	Grain-Size Analysis (%)				Atterberg Limits (%)			
		Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification (USCS)
BH 21-2: SS5	3.0 – 3.6	3	7	24	66	55	27	28	Clay of High Plasticity (CH)
BH 21-2: SS7	6.1 – 6.7	0	1	29	70	58	29	29	Clay of High Plasticity (CH)

Based on the results of the grain size analysis and Atterberg Limits, the soil may be classified as a clay (CH) of high plasticity in accordance with the Unified Soil Classification System (USCS).

4.3 Inferred Boulders or Bedrock

Based on the dynamic cone penetration test (DCPT) results from Borehole No.21-1, cone refusal was met on inferred boulders or bedrock at a 21.7 m depth (Elevation 48.5 m). The bedrock geology map (Map 1508A – Generalized Bedrock Geology, Ottawa-Hull, Ontario and Quebec, Geological Survey of Canada, printed by the Surveys and Mapping Branch, 1979) indicates the site is underlain by limestone bedrock of the Ottawa or Eastview formations.

4.4 Groundwater Level

The groundwater level measurements taken on March 30, 2021 in the monitoring wells installed in Borehole Nos. 21-1 and 21-2 indicate the groundwater level is at 2.4 m and 3.5 m depths below the existing ground surface (Elevation 67.8 m and Elevation 66.7 m).

Groundwater levels were determined in the boreholes at the times and under the conditions stated in the scope of services. Note that fluctuations in the level of groundwater may occur due to a seasonal variation such as precipitation, snowmelt, rainfall activities, and other factors not evident at the time of measurement and therefore may be at a higher level during wet weather periods.

5. Seismic Site Classification and Liquefaction Potential of Soils

5.1 Site Classification for Seismic Site Response

Based on the borehole information and Table 4.1.8.4.A in the 2012 Ontario Building Code (as amended May 2, 2019), the site classification for seismic site response is **Class D**.

5.2 Liquefaction Potential of Soils

The subsurface soils are not susceptible to liquefaction during a seismic event.

6. Grade Raise Restrictions

The site is underlain by a sensitive marine clay deposit that is prone to consolidation settlement if overstressed by loads imposed on it by site grade raise, foundations and by the permanent lowering of the groundwater level following construction. Overstressing of the clay will result in its consolidation and subsequent settlement of foundations, which may exceed tolerable limits of the structure resulting in cracking of the structure.

Since the site is located in a well-established developed area of the city of Ottawa, raising the grades at the site is not anticipated as part of the proposed development. Therefore, the geotechnical engineering comments and recommendations provided in this report are based on the assumption that there will be no raise in the site grades for this project.

Since the site is underlain by a sensitive marine clay that is susceptible to consolidation settlement, if the above assumption is incorrect, EXP should be contacted to review the acceptability of the proposed grade raise from a geotechnical point of view and provide updated bearing pressure value at serviceability limit state (SLS) and factored geotechnical resistance value at ultimate limit state (ULS) for the footings of the proposed new building addition, in view of the proposed site grade raise.

7. Foundation Considerations

Review of the borehole logs indicates the subsurface condition consists of fill underlain by stiff to very stiff clay contacted at approximate 1.8 m and 2.3 m depths below existing grade (Elevation 68.4 m to Elevation 67.8 m). The groundwater level was measured at a 2.4 m and 3.5 m depths below existing grade (Elevation 67.8 m and Elevation 66.7 m).

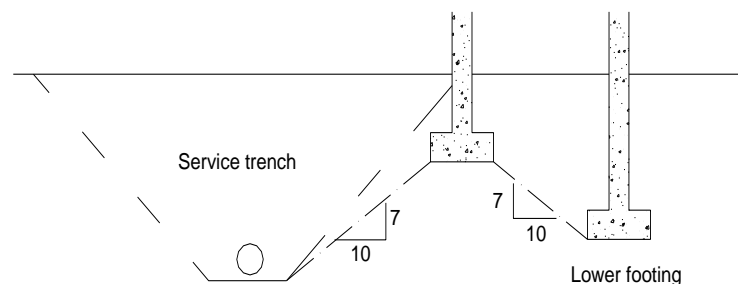
It is our understanding that the basement floor of the existing building is at an approximate 0.9 m depth below existing grade (Elevation 69.3 m) and the footings of the existing building are at a 1.4 m depth below existing grade (Elevation 68.8 m and Elevation 68.7 m)

The proposed building addition may be supported by a strip footing having a maximum width of 1.5 m and square pad footings having a maximum width and length of 2.0 m founded on the surface of the undisturbed native clay contacted at approximately 1.8 m and 2.3 m depths (Elevation 68.4 m and Elevation 67.8 m). The footings may be designed for a bearing pressure at serviceability limit state (SLS) of 150 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 210 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. The recommended SLS and factored ULS values are valid provided the footings are set on the top of the native undisturbed clay and that there is no site grade raise as part of this development. Should the footings extend to depths below the surface of the native clay, EXP should be contacted to review and provide updated SLS and factored ULS values for the footings.

The total and differential settlements of footings designed in accordance with the recommendations of this report and with careful attention to construction detail are expected to be less than 25 mm and 19 mm respectively.

The footings for the proposed new addition located immediately adjacent to the footings of the existing building should be located at the same elevation as the bottom of the existing footing to eliminate the need for underpinning of the existing footing. This is subject to confirmation that the founding soil at the same level as the bottom of the existing footing is capable of supporting the design SLS and factored ULS values noted above. If deeper excavation is required for the new footings located adjacent to existing footings, underpinning of the existing footings may be required. EXP can provide additional recommendations regarding the underpinning of the existing footings.

Footings at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical (10H:7V) from the near edge of the lower footing. This concept should also be applied to service excavation, etc. to ensure that undermining is not a problem.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footing beds should be examined by a geotechnical engineer to ensure that the founding soil is capable of supporting the bearing pressure at SLS and that the footings have been properly prepared.

It should be noted that the exposed clay subgrade surface is susceptible to disturbance due to movement of workers and construction traffic and the prevailing weather conditions during construction. To prevent disturbance to the clay subgrade, the approved footing beds should be covered or protected with a 50 mm thick concrete mud slab.

A minimum of 1.5 m of earth cover should be provided to the exterior foundations of heated structures to protect them from damage due to frost penetration. The frost cover should be increased to 2.1 m for unheated structures if snow will not be removed from their vicinity and to 2.4 m if snow will be removed from the vicinity of the structure. When earth cover is less than the minimum required, an equivalent thermal combination of earth cover and rigid insulation or rigid insulation alone should be provided. EXP can provide additional comments in this regard, if required.

The recommended bearing pressure at SLS and factored geotechnical resistances at ULS have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field monitoring provided by an experienced geotechnical engineer to validate the information for use during the construction stage.

8. Slab-on-Grade Construction and Permanent Drainage Systems

8.1 Slab-on-Grade Construction

It is our understanding that the basement floor for the proposed new building addition will be placed at a 0.9 m depth below existing grade (Elevation 69.2 m and Elevation 69.3 m) to match the basement floor of the existing building. The basement floor of the proposed building addition may be designed as a slab-on-grade set on the native clay or on a minimum 300 mm thick engineered fill pad placed on the native clay and should consist of Ontario Provincial Standard Specification (OPSS) Granular B Type II compacted to 98 percent standard Proctor maximum dry density (SPMDD). The existing fill is not considered suitable to support the slab-on-grade. The floor slab should be set on a bed of well-packed 19 mm clear stone at least 200 mm thick placed on the engineered fill pad or native clay. The clear stone would prevent the capillary rise of moisture from the sub-soil to the floor slab. Adequate saw cuts should be provided in the floor slab to control cracking.

8.2 Permanent Drainage Systems and Impact on Neighboring Structures and Infrastructure

A perimeter drainage system should be installed around the proposed new building addition. If the perimeter drainage system of the existing building is encountered during the construction of the new building addition, it should be reinstated following construction of the new building addition.

The groundwater level is at a 2.4 m and 3.5 m depths (Elevation 67.8 m and Elevation 66.7 m). The basement floor slab of the new building will be at a 0.9 m depth (Elevation 69.2 m and Elevation 69.3 m). Since the basement floor of the new addition will be approximately 1.4 m to 2.6 m above the groundwater level, an underfloor drainage system is not required for the new building addition.

The perimeter drainage systems for the new building addition is anticipated to above the groundwater level and as such the drainage system is not anticipated to lower the groundwater level over the long-term. Therefore, the perimeter drainage system is not anticipated to adversely impact neighboring structures and infrastructure from a groundwater level perspective.

The finished floor slab should be set at least 150 mm higher than the finished exterior grade. The finished exterior grade should be sloped away from the building to prevent ponding of surface water close to the exterior walls of the proposed building addition.

9. Lateral Earth Pressure to Subsurface Walls

The subsurface basement walls of the proposed building addition should be backfilled with free draining material, such as OPSS 1010 Granular B Type II and equipped with a perimeter drainage system to prevent the buildup of hydrostatic pressure behind the walls. The walls will be subjected to lateral static and dynamic (seismic) earth forces. The expressions below assume free draining backfill material, a perimeter drainage system, level backfill surface behind the wall and vertical face on the back side of the wall.

For design purposes, the lateral static earth thrust against the subsurface walls may be computed from the following equation:

$$P = K_0 h (\frac{1}{2} \gamma h + q)$$

where P = lateral earth thrust acting on the subsurface wall; kN/m

K_0 = lateral earth pressure coefficient for 'at rest' condition for Granular B Type II backfill material = 0.50

γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m³

h = depth of point of interest below top of backfill, m

q = surcharge load stress, kPa

The lateral dynamic (seismic) thrust may be computed from the equation given below:

$$\Delta_{pe} = \gamma H^2 \frac{a_h}{g} F_b$$

where Δ_{pe} = dynamic thrust in kN/m of wall

H = height of wall, m

γ = unit weight of backfill material = 22 kN/m³

$\frac{a_h}{g}$ = seismic coefficient = 0.32

F_b = thrust factor = 1.0

The dynamic (seismic) thrust does not take into account the surcharge load. The resultant force acts approximately at 0.63H above the base of the wall.

All subsurface walls of the proposed new building addition should be properly damp-proofed.

10. Excavation and De-Watering Requirements

10.1 Excess Soil Management

Ontario Regulation 406/19 made under the Environmental Protection Act (November 28, 2019) has been enacted as of January 1, 2021. The new regulation dictates the testing protocol required for the management and disposal of excess soils. As set forth in the regulation, specific analytical testing protocols need to be implemented and followed based on the volume of soil to be managed. The testing protocols are specific as to whether the soils are stockpiled or in situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. EXP would be pleased to assist with the implementation of a soil management and testing program that would satisfy the requirements of Ontario Regulation 406/19.

10.2 Excavations

The excavations for the building addition foundations are expected to extend to a maximum depth of 2.3 m below the existing ground surface. These excavations will extend through the fill and to the native clay. The excavations are anticipated to be at or above the groundwater level.

It is anticipated that excavations may be undertaken using conventional equipment capable of removing cobbles, boulders and construction debris within the fill (such as concrete pieces). All excavation work should be completed in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. As per OHSA, the sidewalls of open cut excavations undertaken within Type 3 soil, must be sloped back at 1H:1V from the bottom of the excavation. Within zones of persistent seepage, the excavation side slopes are expected to slough and eventually stabilize at 2H:1V to 3H:1V from the bottom of the excavation.

If side slopes cannot be achieved due to space restrictions, such as the proximity of the excavation to neighboring structures (existing buildings) and infrastructure, the excavation for the proposed new building addition would have to be undertaken within the confines of an engineered support system (shoring system).

The type of foundation and horizontal distance of the foundations of the neighboring buildings and the infrastructure to the excavation for the proposed new building addition and the founding depths of the foundations of the neighboring buildings and the invert depths of the neighboring infrastructure would have to be determined to assess the need for a shoring system for the excavation of the proposed new building addition. This information would also be required for the design of the shoring system, should it be determined that a shoring system will be required for the excavation of the new building addition.

The need for a shoring system, the most appropriate type of shoring system and the design and installation of the shoring system should be determined by the contractors bidding on this project. The design of the shoring system should be undertaken by a professional engineer experienced in shoring design and the installation of the shoring system should be undertaken by a contractor experienced in the installation of shoring systems. The shoring system should be designed and installed in accordance with latest edition of Ontario Regulation 213/91 under the OHSA and the 2006 Fourth Edition of the Canadian Foundation Engineering Manual (CFEM).

The shoring system as well as the existing building on site, the adjacent neighboring settlement sensitive structures (such as the neighboring buildings) and neighboring infrastructure should be monitored for movement (deflection) on a periodic basis during construction operations.

A pre-construction condition survey of the existing building, adjacent neighboring structures and infrastructure should be undertaken prior to the start of any construction activities.

It is recommended that vibration monitoring be conducted at the site and at adjacent neighboring structures (such as the existing buildings) and infrastructure during the installation of the shoring system and during construction of the new building addition. This is to ensure the existing neighboring structures and infrastructure are not damaged as a result of the construction activities and the installation of the shoring system for the proposed new building addition.

Base heave type failure is not expected in excavations that extend to the surface of the native clay anticipated at a maximum 2.3 m depth below existing grade.

The clay stratum at the site is susceptible to disturbance due to the movement of construction equipment and personnel on its surface. It is therefore recommended that the excavation at the site should be undertaken by equipment that does not need to travel on the excavated surface, such as a gradall or mechanical shovel.

Extra care should be exercised during the excavation close to the existing building to prevent the undermining of the existing footings. Reference is made to Section 7 of this report regarding measures to prevent the undermining of existing footings.

Many geologic materials deteriorate rapidly upon exposure to meteorological elements. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from moisture, desiccation, and frost action throughout the course of construction.

10.3 De-Watering Requirements and Impact on Neighboring Structures and Infrastructure

Seepage of the surface and subsurface water into these excavations is anticipated. However, it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. In areas of high infiltration or in areas where more permeable soil layers may exist, a higher seepage rate should be anticipated and may require high capacity pumps to keep the excavation dry.

The excavations for foundations are anticipated to be at or above the groundwater level and as such the removal of groundwater from the excavation is anticipated to be minimal or not at all. Therefore, groundwater removal during the short-term construction activities is not anticipated to impact existing neighboring structures (buildings) and infrastructure.

It has been assumed that the maximum excavation depth at the site for foundations of the new building addition will be approximately 2.2m below existing grade and minimal groundwater removal is anticipated. Therefore, it is noteworthy to mention that new legislation came into force in Ontario on March 29, 2016 to regulate groundwater takings for construction dewatering purposes. Prior to March 29, 2016, a Category 2 Permit to Take Water (PTTW) was required from the Ontario Ministry of the Environment and Climate Change (MOECC) for groundwater takings related to construction dewatering, where taking volumes in excess of 50 m³/day, but less than 400 m³/day, and the taking duration was no more than 30 consecutive days. The new legislation replaces the Category 2 PTTW for construction dewatering with a new process under the Environmental Activity and Sector Registry (EASR). The EASR is an on-line registry, which allows persons engaged in prescribed activities, such as water takings, to register with the MOECC instead of applying for a PTTW.

To be eligible for the new EASR process, the construction dewatering taking must be less than 400 m³/day under normal conditions. The water taking can be groundwater, storm water, or a combination of both. It should be noted that the 30-consecutive day limit on the water taking under the old Category 2 PTTW process has been removed in the new EASR process. Also, it should be noted that the EASR process requires two technical studies be prepared by a Qualified Person, prior to any water taking. These studies include a Water Taking Report, which provides assurance that the taking will not cause any unacceptable impacts, and a Discharge Plan, which provides assurance that the discharge will not result in any adverse impacts to the environment. EXP has qualified persons who can prepare these types of reports, if required. A significant advantage of the new EASR process over the former Category 2 PTTW process, is that the groundwater taking may begin immediately after completing the on-line registration of the taking and paying the applicable fee, assuming the accompanying technical studies have been completed. The former PTTW process typically took more than 90 days, which had the potential to impact construction schedules.

Although this investigation has estimated the groundwater levels at the time of the fieldwork, and commented on dewatering and general construction problems, conditions may be present which are difficult to establish from standard boring and excavating techniques and which may affect the type and nature of dewatering procedures used by the contractor in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile, thin layers of soil with large or small permeabilities compared with the soil mass, etc. Only carefully controlled tests using pumped wells and observation wells will yield the quantitative data on groundwater volumes and pressures that are necessary to adequately engineer construction dewatering systems.

11. Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The materials to be excavated from the site will consist of sand with gravel fill, silty clayey sand with gravel fill, topsoil, and native clay. Portions of the fill (free of cobbles, boulders and construction debris) may be re-used as backfill material, subject to additional geotechnical evaluation and testing at time of construction. The remaining excavated soils are not considered suitable for use under structural elements and for backfilling purposes and therefore must be disposed off-site or used in landscaped areas.

It is anticipated that the majority of the material required for underfloor fill and backfilling purposes would have to be imported and should preferably conform to the following specification:

- Engineered fill under the slab-on-grade area - OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent SPMDD.
- Backfill in footing trenches and against foundation walls – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent of the SPMDD inside the building and 95 percent SPMDD outside the building respectively.
- Backfill in services trenches inside building – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent of the SPMDD.
- Backfill in exterior services trenches or exterior subgrade fill– OPSS 1010 Select Subgrade Material (SSM) placed in 300 mm thick lifts and each lift compacted to 95 percent of the SPMDD or on-site approved excavated material as noted above.

12. Subsurface Concrete and Steel Requirements

Chemical tests limited to pH, chloride, sulphate and resistivity were performed on one (1) soil sample. The certificate of the laboratory analysis is attached in Appendix A and the results are summarized in Table III.

Borehole No. (Sample No.)	Soil Type	Depth (m)	pH	Sulphate (%)	Chloride (%)	Resistivity (ohm-cm)
BH21-2 (SS5)	Clay	3.0 – 3.6	7.89	0.0547	0.0855	478

The sulphate content in the clay is less than 0.1 percent. This concentration in the clay would have a negligible potential of sulphate attack on subsurface concrete. The concrete should be designed in accordance with Table Nos. 3 and 6 of CSA A.23.1-14. However, the concrete should be dense, well compacted and cured.

Based on a review of the resistivity test result, the clay sample is considered to be very corrosive to bare steel as per the National Association of Corrosion Engineers (NACE). Appropriate measures should be undertaken to protect buried steel elements from corrosion.


13. General Comments


The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions, between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well, as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The information contained in this report is not intended to reflect on environmental aspects of the soils and groundwater. Should specific information be required, including for example the presence of pollutants, contaminants or other hazards in the soil, additional testing may be required.

We trust that the information contained in this report is satisfactory for your purposes. Should you have any questions, please contact this office.

Sincerely,


Susan M. Potyondy, P.Eng.
Senior Project Manager, Geotechnical Services
Earth and Environment




Ismail M. Taki, M.Eng., P.Eng.
Senior Manager, Eastern Region
Earth and Environment

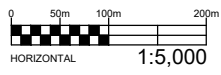
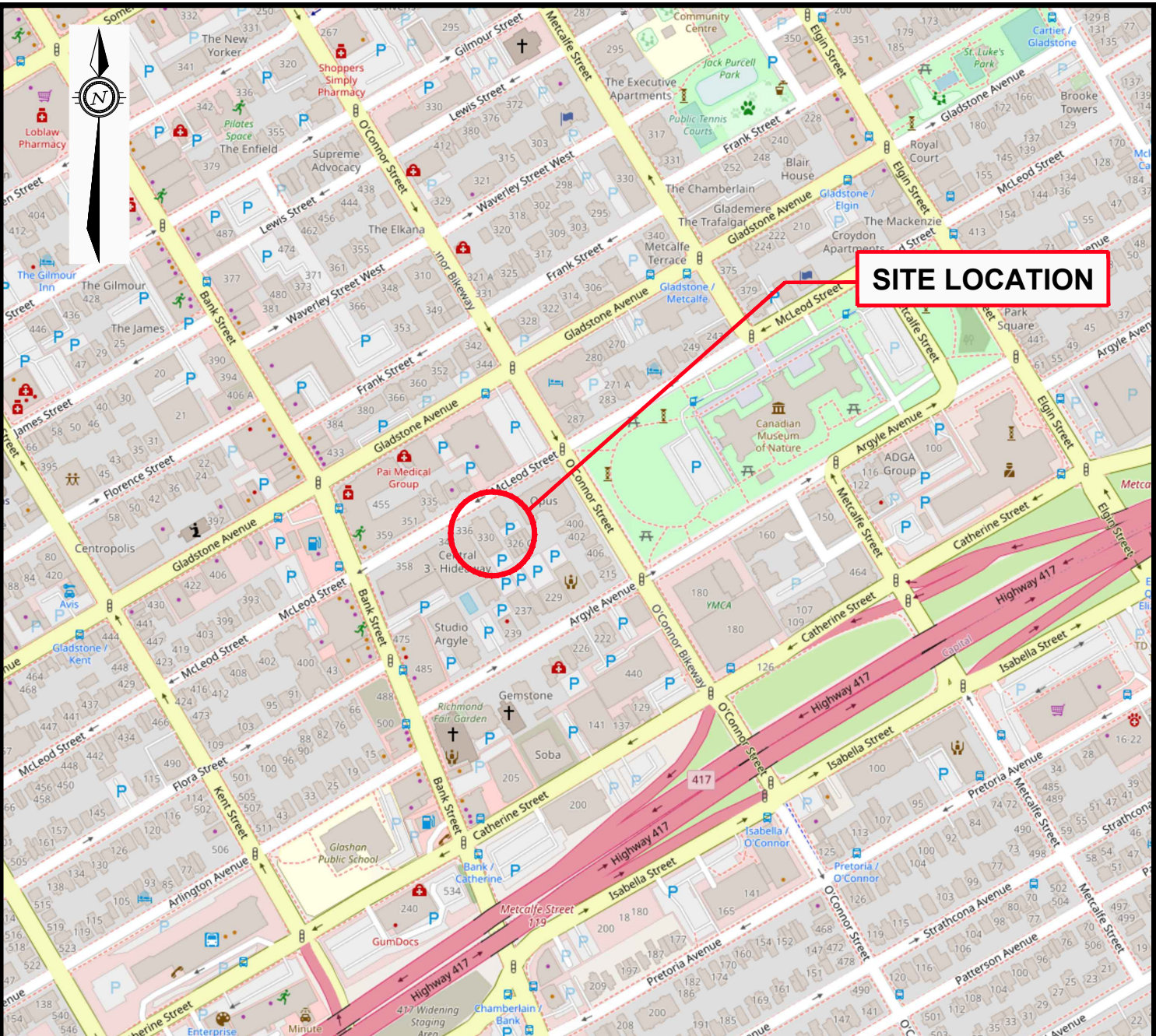
EXP Services Inc.

*Smart Living Properties
Geotechnical Investigation, Proposed Additions to Residential Building
330 McLeod Street, Ottawa, ON
OTT-00262765-A0
October 18, 2021*

Figures



SITE LOCATION



Filename: E:\OTT\00262765-A0\60 Execution\65 Drawings\geotech\262765-A0_330 McLeod St.dwg
Last Saved: Apr 6, 2021 9:41 AM Last Plotted: Apr 16, 2021 8:54 AM Plotted by: McKeet

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6



www.exp.com

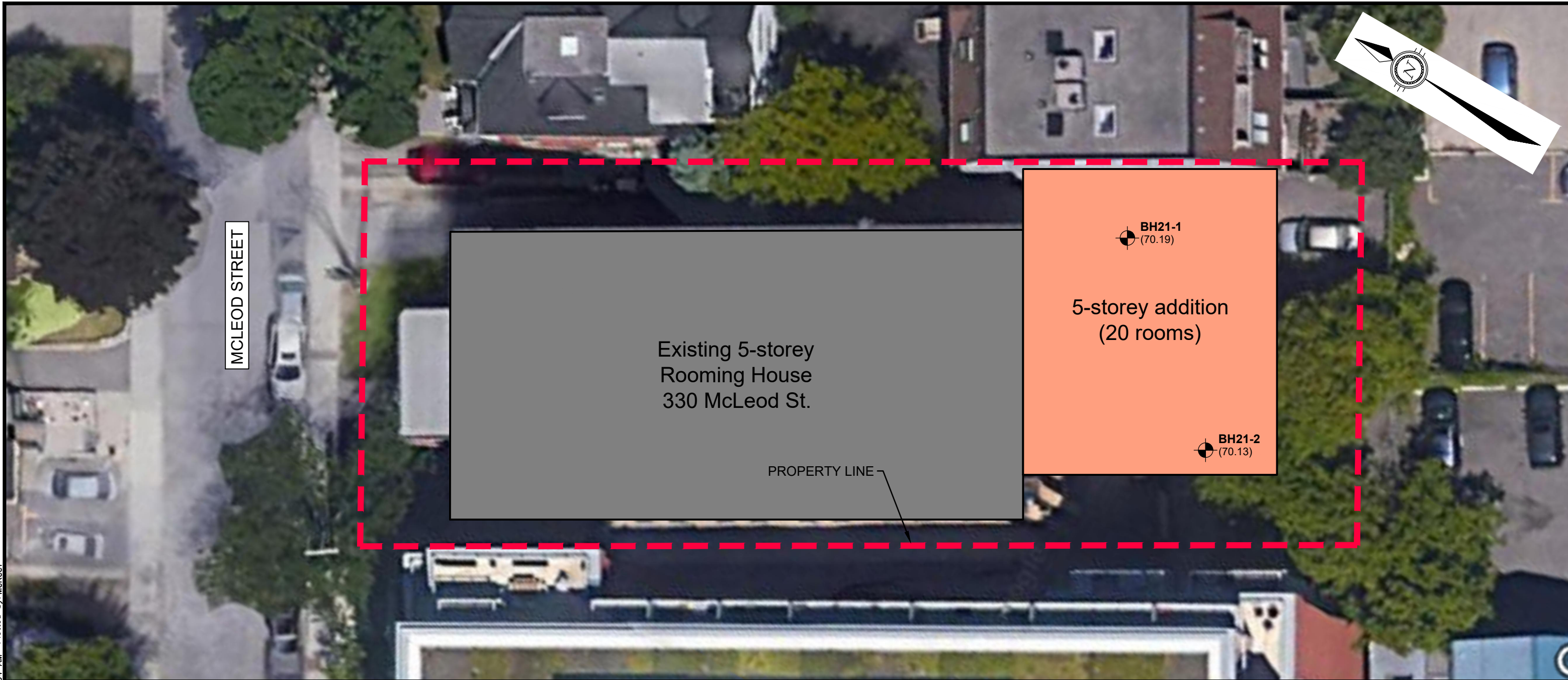
DESIGN	AN
DRAWN	TM
DATE	APRIL, 2021
FILE NO	OTT-00262765-A0

GEOTECHNICAL INVESTIGATION
PROPOSED ADDITION TO
RESIDENTIAL BUILDING

SITE LOCATION PLAN

330 MCLEOD STREET, OTTAWA, ONTARIO

SCALE	1:5,000
SKETCH NO	
FIG 1	



MCLEOD STREET

Existing 5-storey
Rooming House
330 McLeod St.


BH21-1
(70.19)

5-storey addition
(20 rooms)

BH21-2
(70.13)

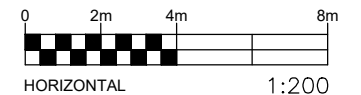
PROPERTY LINE


LEGEND

 **BH21-1** BOREHOLE NO. & LOCATION
(69.82) (APPROXIMATE GROUND SURFACE
ELEVATION, m)

NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE BOREHOLE LOCATIONS.
4. BOREHOLE ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.

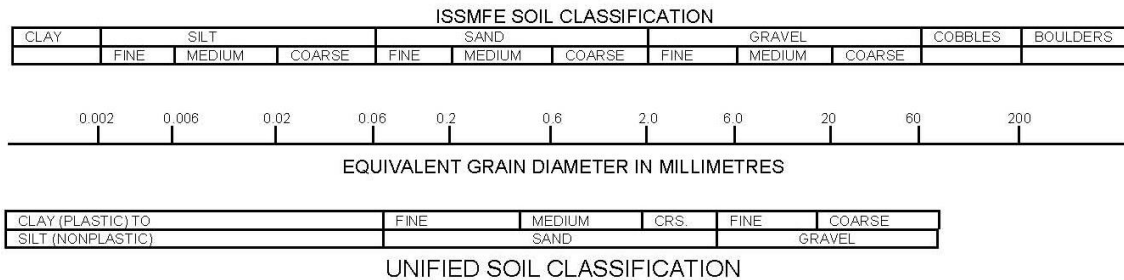


EXP Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com		DESIGN AN	GEOTECHNICAL INVESTIGATION PROPOSED ADDITION TO RESIDENTIAL BUILDING	SCALE 1:200
		DRAWN TM		SKETCH NO
		DATE APRIL, 2021	BOREHOLE LOCATION PLAN 330 MCLEOD STREET, OTTAWA, ONTARIO	FIG 2
		FILE NO OTT-00262765-A0		

Filename: E:\OTT\00262765-A0\60 Execution\65 Drawings\geotech\262765-A0_330 McLeod St.dwg
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Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** Services Inc. also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.



2. **Fill:** Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.
3. **Till:** The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole BH21-1



Project No: OTT-00262765-B0

Figure No. 3

Project: Proposed Addition to Residential Building

Page. 1 of 2

Location: 330 McLeod Street, Ottawa, Ontario

Date Drilled: March 22, 2021

Split Spoon Sample

Combustible Vapour Reading

Drill Type: Track Mounted Drill Rig

Auger Sample

Natural Moisture Content

SPT (N) Value

Atterberg Limits

Datum: Approximate Elevation

Dynamic Cone Test

Undrained Triaxial at % Strain at Failure

Shelby Tube

Shear Strength by Penetrometer Test

Logged by: A. Neguss Checked by: A. Nader

Shear Strength by Vane Test

GWL	SOIL DESCRIPTION	Approximate Elevation m	Depth m	Standard Penetration Test N Value				Combustible Vapour Reading (ppm)			Natural Unit Wt. kN/m ³
				Shear Strength kPa				250	500	750	
				20	40	60	80	Natural Moisture Content % Atterberg Limits (% Dry Weight)			
	FILL Sand with gravel (SM), grey, moist, (compact)	70.19	0	18					X		SS1 20.4
	BURIED TOPSOIL ~150 mm thick	69.5 69.3									
	FILL Sand with gravel (SM), cobbles and boulders, concrete debris, brown, moist, (loose)	68.4	1	4					X		SS2
	CLAY (CH) With silt layers, high plasticity, sensitive, grey, (stiff to very stiff)		2	7		144			X		SS3 17.9
			3	3						X	SS4
		66.65	3	Hammer Weight						X	SS5
			4	72 s=6.0							
			4	67 s=4.8							
			5	Hammer Weight						X	SS6
			5	67 s=5.6							
			6	Hammer Weight						X	SS7
		63.2	7	72 s=6.0							
	Dynamic Cone Penetration Test (DCPT) conducted from 7.0 m depth to refusal at 21.7 m depth		7								
			8								
			9								
			10								

Continued Next Page

LOG OF BOREHOLE LOGS OF BOREHOLES_262765_330_MCLEOD_ST.GPJ_TROW OTTAWA.GDT 4/16/21

NOTES:

- Borehole data requires interpretation by EXP before use by others
- A 32 mm diameter monitoring well installed upon completion of drilling.
- Field work supervised by an EXP representative.
- See Notes on Sample Descriptions
- Log to be read with EXP Report OTT-00262765-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
On Completion	2.6	
Mar 30, 2021	3.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH21-1



Project No: OTT-00262765-B0

Project: Proposed Addition to Residential Building

Figure No. 3

Page 2 of 2

SOIL	SOIL DESCRIPTION	Approximate Elevation m	Standard Penetration Test N Value				Combustible Vapour Reading (ppm)			Natural Unit Wt. kN/m ³
			20	40	60	80	250	500	750	
			Shear Strength				Natural Moisture Content % Atterberg Limits (% Dry Weight)			
			50	100	150	200	20	40	60	
	Dynamic Cone Penetration Test (DCPT) conducted from 7.0 m depth to refusal at 21.7 m depth (<i>continued</i>)	60.19	10				10			
			11				11			
			12				12			
			13				13			
			14				14			
			15				15			
			16				16			
			17				17			
			18				18			
			19				19			
			20				20			
			21				21			
	Cone Refusal at 21.7 m Depth	48.5								

LOG OF BOREHOLE LOGS OF BOREHOLES_262765_330.MCLEOD ST.GPJ TROW OTTAWA.GDT 4/16/21

NOTES:
 1. Borehole data requires interpretation by EXP before use by others
 2. A 32 mm diameter monitoring well installed upon completion of drilling.
 3. Field work supervised by an EXP representative.
 4. See Notes on Sample Descriptions
 5. Log to be read with EXP Report OTT-00262765-B0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
On Completion	2.6	
Mar 30, 2021	3.5	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH21-2



Project No: OTT-00262765-B0
 Project: Proposed Addition to Residential Building
 Location: 330 McLeod Street, Ottawa, Ontario
 Date Drilled: March 19, 2021
 Drill Type: Track Mounted Drill Rig
 Datum: Approximate Elevation
 Logged by: A. Neguss Checked by: A. Nader

Figure No. 4
 Page. 1 of 1

Split Spoon Sample Combustible Vapour Reading
 Auger Sample Natural Moisture Content
 SPT (N) Value Atterberg Limits
 Dynamic Cone Test Undrained Triaxial at % Strain at Failure
 Shelby Tube Shear Strength by Penetrometer Test
 Shear Strength by Vane Test

GWL	SOIL DESCRIPTION	Approximate Elevation m	Depth m	Standard Penetration Test N Value				Combustible Vapour Reading (ppm)			Natural Unit Wt. kN/m ³	
				Shear Strength kPa				250	500	750		
				20	40	60	80	Natural Moisture Content % Atterberg Limits (% Dry Weight)				
	FILL Sand with gravel (SM), grey, moist, (loose to compact)	70.13	0	15					X			SS1
			1	4					X			SS2
	FILL Silty clayey sand with gravel (SC-SM), grey, moist, (very loose)	68.6	2	2								SS3
	CLAY (CH) With silt layers, high plasticity, medium sensitivity to sensitive, grey, (stiff)	67.8	3	Hammer Weight								SS4
		67.75	4	86 s=4.5								SS5
			5	67 s=3.9								SS6
			6	62 s=3.6								SS7
			7	58 s=3.1								
	Borehole Terminated at 7.0 m Depth	63.1										

NOTES:
 1. Borehole data requires interpretation by EXP before use by others
 2. A 32 mm diameter monitoring well installed upon completion of drilling.
 3. Field work supervised by an EXP representative.
 4. See Notes on Sample Descriptions
 5. Log to be read with EXP Report OTT-00262765-B0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
On Completion	2.7	7.0
Mar 30, 2021	2.4	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE LOGS OF BOREHOLES_262765_330 MCLEOD ST.GPJ TROW OTTAWA.GDT 4/16/21

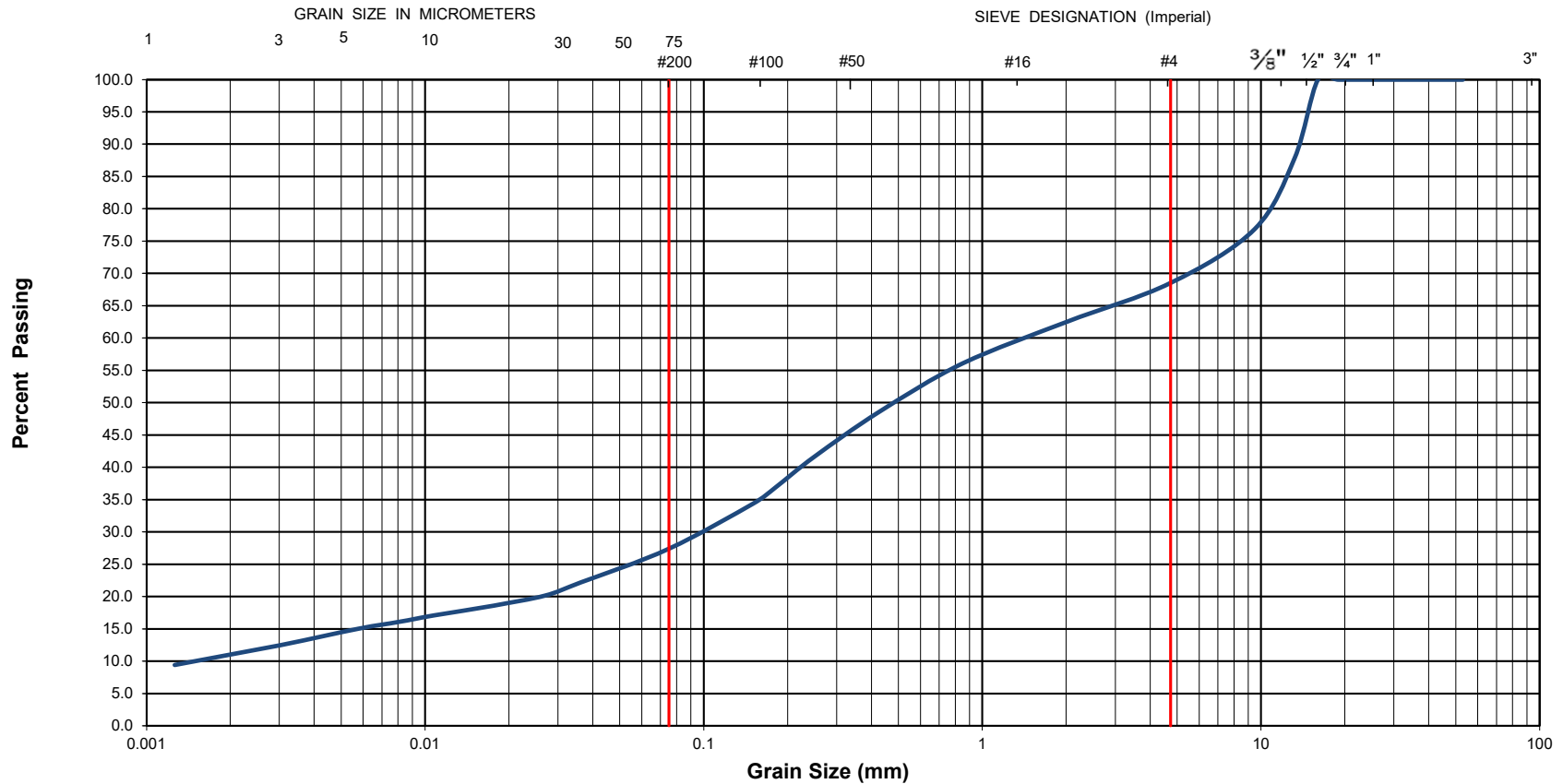


Grain-Size Distribution Curve Method of Test For Particle Size Analysis of Soil ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



EXP Project No.:	OTT-00262765-B0	Project Name :	Proposed Addition to Residential Building		
Client :	Smart Living Properties	Project Location :	330 McLeod Street, Ottawa, Ontario		
Date Sampled :	March 19, 2021	Borehole No:	BH21-2	Sample No.: SS3	
Sample Description :	% Silt and Clay	27	% Sand	42	
Sample Description :			% Gravel	31	
Sample Description :	FILL: Silty Clayey Sand with Gravel (SC-SM)			Depth (m) :	1.5-2.1
				Figure :	5

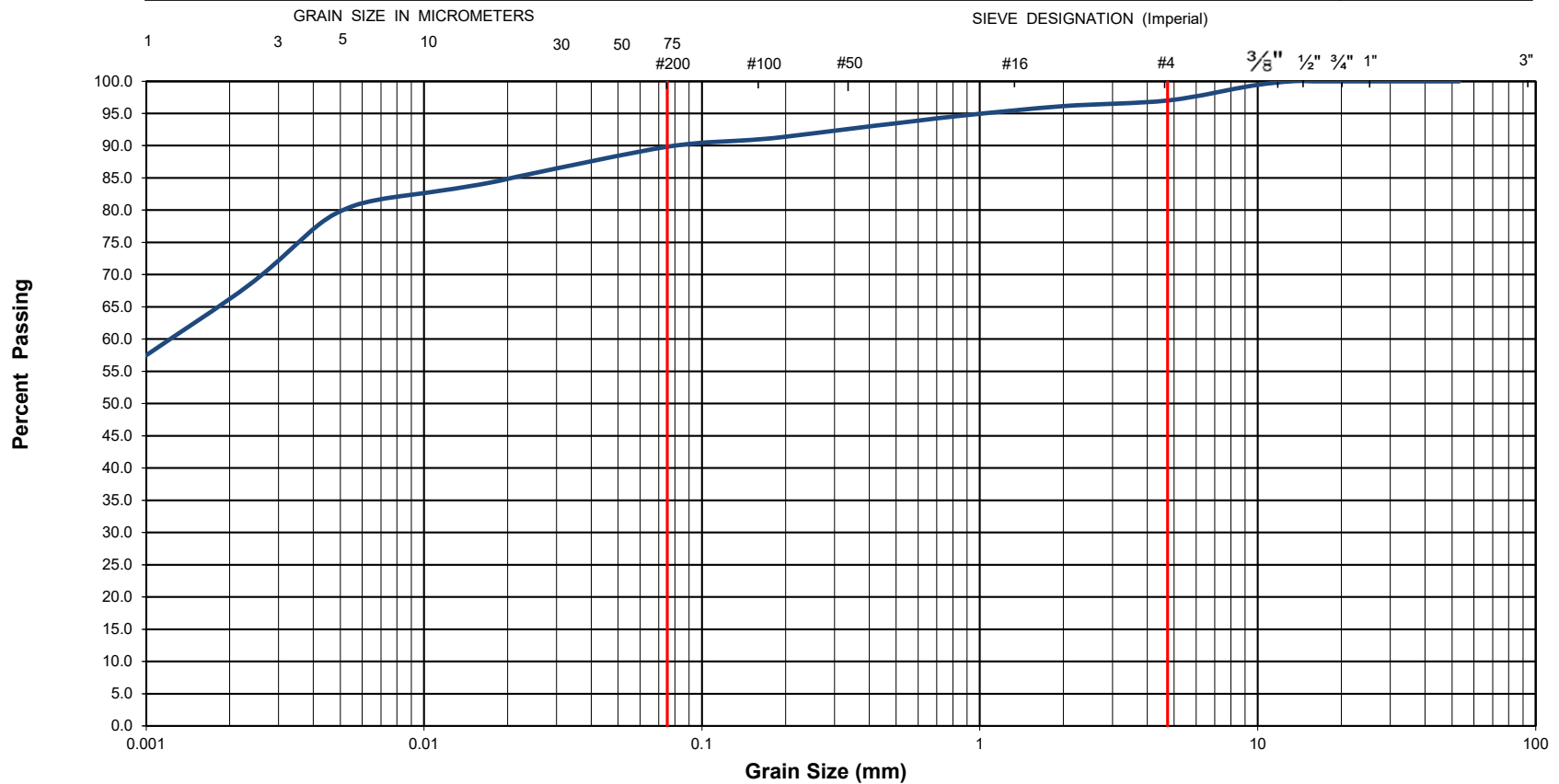


Grain-Size Distribution Curve Method of Test For Particle Size Analysis of Soil ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



EXP Project No.:	OTT-00262765-B0	Project Name :	Proposed Addition to Residential Building		
Client :	Smart Living Properties	Project Location :	330 McLeod Street, Ottawa, Ontario		
Date Sampled :	March 19, 2021	Borehole No:	BH21-2	Sample No.: SS5	
Sample Description :	% Silt and Clay	90	% Sand	7	
Sample Description :			% Gravel	3	
Sample Description :	CLAY of High Plasticity (CH)			Figure :	6
		Depth (m) :		3.0-3.6	

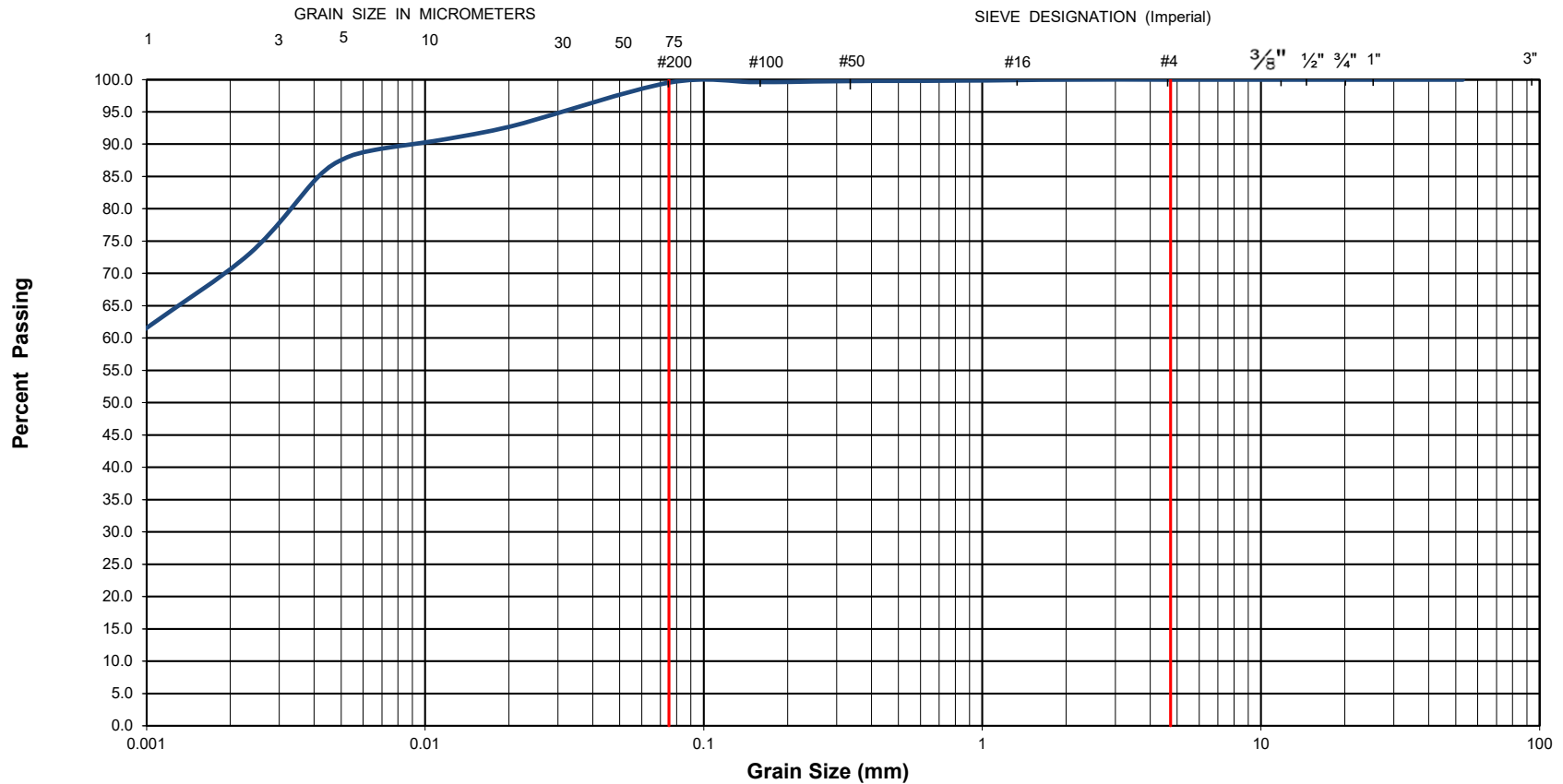


Grain-Size Distribution Curve Method of Test For Particle Size Analysis of Soil ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



EXP Project No.:	OTT-00262765-B0	Project Name :	Proposed Addition to Residential Building		
Client :	Smart Living Properties	Project Location :	330 McLeod Street, Ottawa, Ontario		
Date Sampled :	March 19, 2021	Borehole No:	BH21-2	Sample No.: SS7	
Sample Description :	% Silt and Clay	99	% Sand	1	
Sample Description :			% Gravel	0	
Sample Description :	CLAY of High Plasticity (CH)			Figure :	7

EXP Services Inc.

*Smart Living Properties
Geotechnical Investigation, Proposed Additions to Residential Building
330 McLeod Street, Ottawa, ON
OTT-00262765-A0
October 18, 2021*

Appendix A: Laboratory Certificate of Analysis



CLIENT NAME: EXP SERVICES INC
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899

ATTENTION TO: Athir Nader

PROJECT: OTT-00262765-A0

AGAT WORK ORDER: 21T725846

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Apr 01, 2021

PAGES (INCLUDING COVER): 6

VERSION*: 1

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

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21T725846

PROJECT: OTT-00262765-A0

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: EXP SERVICES INC

SAMPLING SITE: 233 Argyle St./330 Meleat St.

ATTENTION TO: Athir Nader

SAMPLED BY: EXP

Inorganic Chemistry (Soil)

DATE RECEIVED: 2021-03-25

DATE REPORTED: 2021-04-01

		SAMPLE DESCRIPTION: 10'-12'		BH#2 SS5
		SAMPLE TYPE: Soil		
		DATE SAMPLED: 2021-03-19		
Parameter	Unit	G / S	RDL	2262835
Chloride (2:1)	µg/g		8	855
Sulphate (2:1)	µg/g		8	547
pH (2:1)	pH Units		NA	7.89
Resistivity (2:1) (Calculated)	ohm.cm		1	478

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2262835 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.

Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Nvine Basily



Certificate of Analysis

AGAT WORK ORDER: 21T725846

PROJECT: OTT-00262765-A0

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: EXP SERVICES INC

SAMPLING SITE: 233 Argyle St./330 Meleat St.

ATTENTION TO: Athir Nader

SAMPLED BY: EXP

Inorganic Chemistry (Soil) %

DATE RECEIVED: 2021-03-25

DATE REPORTED: 2021-04-01

		SAMPLE DESCRIPTION:		BH#2 SS5
		SAMPLE TYPE:		10'-12'
		DATE SAMPLED:		Soil
				2021-03-19
Parameter	Unit	G / S	RDL	2262835
Chloride (2:1)	%		0.0008	0.0855
Sulphate (2:1)	%		0.0008	0.0547

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
2262835 Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).
 Dilution required, RDL has been increased accordingly.
 Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Nvine Basily

Quality Assurance

CLIENT NAME: EXP SERVICES INC
AGAT WORK ORDER: 21T725846
PROJECT: OTT-00262765-A0
ATTENTION TO: Athir Nader
SAMPLING SITE: 233 Argyle St./330 Meleat St.
SAMPLED BY: EXP

Soil Analysis

RPT Date: Apr 01, 2021
DUPLICATE
REFERENCE MATERIAL
METHOD BLANK SPIKE
MATRIX SPIKE

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Inorganic Chemistry (Soil)

Chloride (2:1)	2262607		3	2	NA	< 2	94%	70%	130%	105%	80%	120%	107%	70%	130%
Sulphate (2:1)	2262607		140	141	0.3%	< 2	91%	70%	130%	97%	80%	120%	105%	70%	130%
pH (2:1)	2279153		7.00	6.86	2.0%	NA	99%	90%	110%						

Comments: NA signifies Not Applicable.

pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

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

Inorganic Chemistry (Soil) %

Chloride (2:1)	2262607		0.0003	0.0002	NA	< 0.0002	94%	70%	130%	105%	80%	120%	107%	70%	130%
Sulphate (2:1)	2262607		0.0140	0.0141	0.7%	< 0.0002	91%	70%	130%	97%	80%	120%	105%	70%	130%

Comments: NA signifies Not Applicable.

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

Certified By:

Nivine Basily



Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 21T725846

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ATTENTION TO: Athir Nader

SAMPLING SITE: 233 Argyle St./330 Meleat St.

SAMPLED BY: EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B, SSA #5 Part 3	CALCULATION



AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
web@earth.agatlabs.com

Laboratory Use Only

Work Order #: 21T725846

Cooler Quantity: one - no ice
Arrival Temperatures: 16.1 | 16.5 | 16.4
1.8 | 1.9 | 2.1

Custody Seal Intact: Yes No N/A
Notes: on ice.

Chain of Custody Record

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

Report Information:

Company: EXP Services Inc. Ottawa
Contact: Athir Nader
Address: 2650 Queensview Dr. Unit 100
Ottawa, ON, K2B 8H6
Phone: 613-688-1899 Fax: _____
Reports to be sent to:
1. Email: athir.nader@exp.com
2. Email: _____

Regulatory Requirements:

(Please check all applicable boxes)

- Regulation 153/04 Excess Soils R406 Sewer Use
 Sanitary Storm
Table _____ Indicate One
 Ind/Com
 Res/Park
 Agriculture
Soil Texture (Check One)
 Coarse CCME
 Fine
Table _____ Indicate One
Region _____
 Prov. Water Quality Objectives (PWQO)
 Other
Indicate One

Turnaround Time (TAT) Required:

- Regular TAT 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
 3 Business Days 2 Business Days Next Business Day
OR Date Required (Rush Surcharges May Apply): _____

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

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

Project Information:

Project: OTT-00262765-A0
Site Location: 233 Argyle St / 336 Meleat St.
Sampled By: EXP
AGAT Quote #: _____ PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition?

- Yes No

Report Guideline on Certificate of Analysis

- Yes No

Sample Matrix Legend

- B** Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Invoice Information:

Bill To Same: Yes No

Company: _____
Contact: _____
Address: _____
Email: _____

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Metals & Inorganics	Metals: <input type="checkbox"/> CrVI, <input type="checkbox"/> Hg, <input type="checkbox"/> HWSB	BTEX, F1-F4 PHCs	Analyze F4G if required <input type="checkbox"/> Yes <input type="checkbox"/> No	PAHs	PCBs	VOC	Landfill Disposal Characterization TOLP: TOLP: <input type="checkbox"/> M&I, <input type="checkbox"/> VOCs <input type="checkbox"/> ABNs <input type="checkbox"/> B(a)P <input type="checkbox"/> PCBs	Excess Soils SPLP Rainwater Leach	SPLP: <input type="checkbox"/> Metals <input type="checkbox"/> VOCs <input type="checkbox"/> SVOCs	Excess Soils Characterization Package	pH, ICP/MS Metals, BTEX, F1-F4	Salt - EC/SAR	PH	Resistivity	Sulphate	Chloride	Potentially Hazardous or High Concentration (Y/N)	
MW21-1 854 7.5-9.5'	Mar. 18	— AM	1	S																					
BH# 2 855 10-12'	Mar. 19	— AM	1	S																					

Samples Relinquished By (Print Name and Sign): <u>Jeff MacMillan</u>	Date: <u>Mar. 23/21</u>	Time: <u>3:52</u>	Samples Received By (Print Name and Sign): <u>Uburthelet</u>	Date: <u>2021/03/23</u>	Time: <u>16:30</u>
Samples Relinquished By (Print Name and Sign): <u>[Signature]</u>	Date: <u>2/23/24</u>	Time: <u>16:00</u>	Samples Received By (Print Name and Sign): <u>Lakshanya</u>	Date: <u>March 25</u>	Time: <u>8:40</u>
Samples Relinquished By (Print Name and Sign): <u>[Signature]</u>	Date: <u>[Blank]</u>	Time: <u>[Blank]</u>	Samples Received By (Print Name and Sign): <u>[Blank]</u>	Date: <u>[Blank]</u>	Time: <u>[Blank]</u>

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EXP Services Inc.

*Smart Living Properties
Geotechnical Investigation, Proposed Additions to Residential Building
330 McLeod Street, Ottawa, ON
OTT-00262765-A0
October 18, 2021*

Appendix B: Legal Notification

EXP Services Inc.

*Smart Living Properties
Geotechnical Investigation, Proposed Additions to Residential Building
330 McLeod Street, Ottawa, ON
OTT-00262765-A0
October 18, 2021*

Legal Notification

This report was prepared by EXP Services Inc. (EXP) for the account of Smart Living Properties.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.



EXP Services Inc.

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Geotechnical Investigation, Proposed Additions to Residential Building
330 McLeod Street, Ottawa, ON
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Report Distribution

Jeremy Silburt, Smart Living Properties; Jeremy@smartlivingproperties.ca

