Geotechnical Investigation
Proposed Addition to Residential Building
23 to 29 Russell Avenue
Ottawa, Ontario

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Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed addition to the existing residential building at the addresses of 23 to 29 Russell Avenue, Ottawa, Ontario (Figure 1). Terms and conditions of this assignment were outlined in EXP's proposal number: OTT-22001495-A0 dated January 19, 2022. Authorization to proceed with this work was provided by Smart Living Properties.

It is our understanding that the proposed addition will consist of a three-story structure with one basement level. The proposed floor plans indicate 3 to 4 residential units on each floor, including the basement, for a total of 14 units. Information regarding the design elevation of the basement floor of the proposed addition and final site grades were not available at the time of this geotechnical investigation. However, it is expected that the finished grades will generally match the existing grades and therefore minimum grade raise will be required at the site as the results of the proposed development.

The fieldwork for the geotechnical investigation was completed on February 23 and 24, 2022 and consists of two (2) boreholes (Borehole Nos. 1 and 2) drilled to cone refusal and termination depths of 14.9 m and 7.0 m below the existing ground surface. The borehole locations are shown on Figure 2. The fieldwork was supervised on a full-time basis by a representative from EXP.

The borehole information indicates the subsurface conditions consist of a thin surficial layer of granular fill underlain by silty sand fill with gravel, cinders and organics, underlain by sand fill to 1.8 m depth followed by firm to very stiff clay to the maximum explored sampling depth of 10.0 m. A dynamic cone penetration test indicates an inferred glacial till layer and bedrock at cone refusal of 14.9 m depth. The groundwater level was measured at 6.5 m below ground surface, 44 days following the completion of the fieldwork. However, based on moisture content of the soil samples, the stabilized groundwater table is expected to be at a depth of up to 4 to 5 m below the existing ground surface.

Based on the borehole information and Table 4.1.8.4.A of the 2012 Ontario Building Code (OBC) as amended May 2, 2019, the site classification for seismic site response is estimated to be **Class D.** The subsurface soils are not susceptible to liquefaction during a seismic event. A higher site class may be obtained if a shear wave velocity measurement is undertaken at the site.

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. However, it is has been assumed that a grade raise of 0.5 m will be required at the site.

Based on a review of the borehole information, the proposed new building addition may be supported by strip and square pad footings designed to bear on the native clay. Strip footings having a maximum width of 1.5 m founded on native clay at 3.6 m depth, may be designed for a bearing pressure at SLS of 150 kPa and factored geotechnical resistance at ULS of 225 kPa.

To minimize the need to underpin or undermine the footings along the east wall of the existing building where the proposed new building addition will be located, it is recommended that basement floor slab and footings for the new building addition be placed at the same depth as that of the existing building . The depth of the existing footings and floor slab were not known at the time of writing this report and therefore it is recommended that this depth be

established in the early stage of the design so appropriate design steps can be taken and implemented during construction, i.e. underpinning, etc., if required

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 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.

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. Underfloor drainage system is not required for the proposed addition.

The subsurface basement walls of the building should be backfilled with free draining material, such as OPSS Granular B Type II compacted to 95 percent SPMDD 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 excavations may be undertaken by conventional excavation and shall 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 on site are considered to be Type 3 and for open cut excavations, the side slopes of the excavation must be cut back at 1H:1V from the bottom of the excavation. If side slopes noted above cannot be achieved due to space restrictions on site, such as the proximity of open cut excavations to the property limits, existing infrastructure or to foundations of adjacent existing buildings the excavation for the new building construction would have to be undertaken within the confines of an engineered support system (shoring system).

Seepage of the surface and subsurface water into the excavations above the groundwater level is anticipated and it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques.

It is anticipated that the majority of the material required for engineered fill and for backfilling purposes for this project would have to be imported and should preferably conform to the specifications provided in the attached report.

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 completed for the proposed addition to the existing residential building at the addresses of 23 to 29 Russell Avenue, Ottawa, Ontario (Figure 1). Terms and conditions of this assignment were outlined in EXP's proposal number: OTT-22001495-A0 dated January 19, 2022. Authorization to proceed with this investigation was provided by Smart Living Properties.

It is our understanding that the residential addition will consist of a three-story structure with one basement level. The proposed floor plans indicate 3 to 4 residential units on each floor, including the basement, for a total of 14 units. Information regarding the design elevation of the basement floor of the proposed addition and final site grades were not available at the time of this geotechnical investigation. However, it is expected that the finished grades will generally match the existing grades and minimum grade raise will be required at the site as the results of the proposed development.

This geotechnical investigation was undertaken to:

a) Establish the subsurface conditions and groundwater levels at 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 liquefication potential of the subsurface soils during 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) Comment on slab-on-grade construction and permanent drainage requirements,

f) Discuss excavation conditions and dewatering requirements during construction of the foundation for the proposed building addition,

g) Comment on backfilling requirements and suitability of the on-site soils for backfilling purposes, and,

h) Discuss the 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 result 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. The site is a rectangular-shaped property bounded along the west side by Russell Avenue, a commercial property to the north, and residential properties to the south and east. The site is currently occupied by a multiple unit residential building with parking in the rear. The proposed addition is planned in the current parking area on the east side (rear) of the building.

The topography of the site is relatively flat.

3. Procedure

The fieldwork for the geotechnical investigation was completed on February 23 and 24, 2022 and consists of two (2) boreholes (Borehole Nos. 1 and 2) drilled to cone refusal and termination depths of 14.9 m and 7.0 m below the existing ground surface. The borehole locations are shown on Figure 2. The fieldwork was supervised on a full-time basis by a representative from EXP.

Prior to the fieldwork, the locations of the boreholes were staked in the field and their locations cleared of any public and private underground services. The boreholes were drilled using a Geo-Probe portable drill rig equipped with hollow stem augers and operated by a drilling specialist subcontracted to EXP. Standard penetration tests (SPTs) were performed in all the boreholes at 0.75 m and 1.5 m depth intervals and the soil samples were retrieved by the split-spoon sampler. The undrained shear strength of the cohesive soil was measured by conducting in-situ vane tests. In Borehole No. 1, a dynamic cone penetration test (DCPT) was conducted from 10.0 m to a cone refusal depth of 14.9 m below ground surface. Elevations of the boreholes were not established.

A 19 mm diameter standpipe (with slotted section) was installed in Borehole No. 1 for long-term monitoring of the groundwater level. The standpipe 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 standpipes.

All soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified accordingly. On completion of the fieldwork, all the soil samples were transported to the EXP laboratory located in the City of 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 Determination .....19 tests
Natural Unit Weight Determination.....4 tests
Grain Size Analysis.....3 tests
Atterberg Limits.....1 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 conditions with depth and groundwater level measurements.

4.1 Granular Fill

A thin layer of frozen granular fill was contacted at the surface in both boreholes.

4.2 Upper Fill

In borehole one, the granular fill is underlain by a gravelly sand with some silt, organics, and cinders. This material was also frozen and therefore, SPT values could not be obtained. The moisture content was measured at 23.2 %.

The results from the grain-size analysis conducted on one (1) selected sample of the fill is summarized in Table I. The grain-size distribution curve is shown in Figure 5.

Table I: Summary of Grain-size Analysis Results – Granular Fill Sample

Borehole No. – Sample No.	Depth (m)	Grain-size Analysis (%)			Soil Classification (USCS)
		Gravel	Sand	Silt and Clay	
BH2 – AS1	0.0 – 0.6	32	55	13	Silty Sand with Gravel (SM)

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

4.3 Subgrade Fill

Subgrade fill was encountered beneath the upper fill in borehole No.1 and granular fill in borehole No. 2. It extended to a depth of 1.8 m below existing grade in both boreholes. The fill consists of sand with trace silt and gravel and some topsoil inclusions. The N values from the standard penetration test (SPT) ranged between 8 and 10 indicating

the fill to be in a loose to compact state. The moisture content of the fill ranges from 8 percent to 28 percent. It is noted that deeper fill may exist close to the existing building as a result of the original building construction.

The results from the grain-size analysis conducted on one (1) selected sample of the fill is summarized in Table II. The grain-size distribution curve is shown in Figure 6.

Table II: Summary of Grain-size Analysis Results – Fill Sample

Borehole No. – Sample No.	Depth (m)	Grain-size Analysis (%)			Soil Classification (USCS)
		Gravel	Sand	Silt and Clay	
BH1 – SS3 (top)	1.5 – 2.1	1	95	4	Poorly Graded Sand (SP)

Based on a review of the results of the grain-size analysis, the fill may be classified as a poorly graded sand in accordance with the Unified Soil Classification System (USCS).

4.4 Clay

Clay was encountered beneath the fill material in both boreholes at 1.8 m depth and extended to the maximum sampling depth of 10 m at Borehole No. 1and to 7 m in Borehole No. 2. The SPT N values within the clay range from hammer weight to 7 blows. Undrained shear strength values completed within the clay ranged from 43 kPa to greater than 170 kPa indicating a clay with firm to very stiff consistency.). The natural moisture content and unit weight of the clay ranged between 36 and 70 percent and 16.6 to 18.0 kN/m^3. Respectively.

The results from the grain-size analysis and Atterberg limit determination conducted on one (1) selected sample of the clay is summarized in Table III. The grain-size distribution curve is shown in Figure 7.

Table III: Summary of Results from Grain-Size Analysis and Atterberg Limit Determination - Clay Sample

Borehole (BH) No. – Sample (SS) No.	Depth (m)	Grain-Size Analysis (%)			Atterberg Limits (%)				
		Gravel	Sand	Fines (Silt and Clay)	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification (USCS)
BH 1 – SS4	2.3 – 2.9	0	2	98	48	75	29	45	Clay of High Plasticity (CH)

Based on a review of the results of the grain-size analysis and Atterberg limits, the soil may be classified as a clay of high plasticity (CH) in accordance with the USCS.

4.5 Cone Penetration Test

A dynamic cone penetration test (DCPT) was conducted in Borehole No. 1 starting at 10 m depth below ground and met refusal at 14.9 m depth below existing grade. It is not known whether refusal was met on boulders or on bedrock. The DCPT test indicates that the clay deposit at the site extend Likely to a depth of 11 m below grade.

4.6 Groundwater Levels

Groundwater level measurements were taken on March 7, 2022 and May 9, 2022 in the standpipe installed at borehole 1. The dates of measurement were 12 and 44 days after installation. The groundwater level was measured at 7.1 m below ground surface on March 7th and 6.5 m on May 9th. However, based on the moisture content of the soil samples recovered, the stabilized groundwater table at the site may rise up to a depth of 4 to 5 m below grade.

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

The borehole information at the site has been examined in accordance with Table 4.1.8.4.A of the 2012 Ontario Building Code (OBC) as amended May 2, 2019. The subsoil at the site is comprised of loose sand fill to 1.8 m depth, underlain by firm to very stiff silty clay of high plasticity to approximately 12 m depth, underlain by till and inferred bedrock at 14.9 m depth. The proposed structure will be founded on the clay at a depth of 3 m below grade. Based on the geotechnical condition established, the site classification for seismic site response has been established as **Class D.** A higher site class may be obtained if a shear waver velocity is completed at the site.

5.2 Liquefaction Potential of Soils

The subsurface soils are not considered to be liquefiable during a seismic event.

6. Grade Raise Restrictions

The site is underlain by a 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, major grade raise is not anticipated to be required at the site as part of the proposed development. However, it has been assumed that a maximum grade raise of 0.5 m will be realized at the site. 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.

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7. Foundation Considerations

The borehole information indicates the subsurface condition consists of fill underlain by firm to very stiff clay contacted at 1.8 m depth below existing grade. The groundwater level is expected to be at a depth of 4 to 5 m below the existing grade.

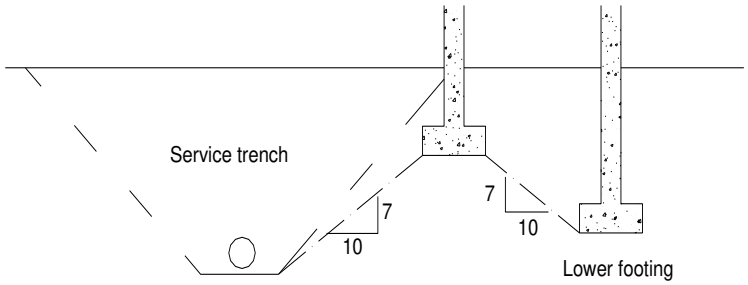
Based on a review of the borehole information, it is considered feasible to support the footings of the proposed building addition on strip and square pad footings designed to bear in the upper 1 to 2 of the native clay deposit, i.e. at a depth of 3 m below grade. Strip footings having a maximum width of 1.5 m founded on native clay at 3.0 m depth may be designed for a bearing pressure at SLS of 150 kPa and factored geotechnical resistance at ULS of 225 kPa. Square pad footings having a width and length of 2.0 m founded in the native clay at 3.6 m depth may be designed for a bearing pressure at SLS of 150 kPa and factored geotechnical resistance at ULS of 225 kPa.

To minimize the need to underpin the existing footings along the east wall of the existing building where the proposed new building addition will be located, it is recommended that the basement floor slab and footings for the new building addition be placed at the same depth as that of the existing building. The depth of the existing footings and floor slab were not known at the time of writing this report and therefore it is recommended that this depth be established in the early stage of the design so appropriate design steps can be taken and implemented during construction, i.e. underpinning, etc.

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.

As previously mentioned, the footings for the proposed new addition located 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, especially during wet weather condition.

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

The existing fill is not suitable as founding material for the basement slab and must be removed from the entire envelope of the proposed building addition.

The basement floor slab of the new building addition may be designed as a slab-on-grade set on the native clay or OPSS 1010 Granular B Type II, engineered fill placed on the native clay and 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 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.

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 perimeter drainage system may comprise of 150 mm diameter perforated pipe or equivalent covered at the top, sides and bottom with a minimum 150 mm thick layer of clear stone that is completely wrapped or covered with a non-woven geotextile such as Terrafix 270R or equivalent. The perimeter drainage system should be connected to a sump to provide positive drainage. Underfloor drainage system is not required for the proposed addition.

The perimeter drainage system for the new building addition will be 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 system is not anticipated to adversely impact neighboring structures and infrastructure from a groundwater level perspective.

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 on Subsurface Walls

The subsurface basement walls of the building should be backfilled with free draining material, such as OPSS Granular B Type II compacted to 95 percent SPMDD 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:

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

where
- P = lateral earth thrust acting on the subsurface wall, kN/m
- K_0 = lateral earth pressure at rest coefficient, assumed to be 0.5 for Granular B Type II backfill material
- γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m^3
- h = depth of point of interest below top of backfill, m
- q = surcharge load stress, kPa

The lateral dynamic 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/m^3
- $\frac{a_h}{g}$ = earth pressure coefficient = 0.32 for Ottawa area
- F_b = thrust factor = 1.0

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

All subsurface walls should be properly waterproofed.

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

Excavation for the construction of the proposed building foundations and installation of the underground municipal services are anticipated to extend a maximum of 3.0 m depth below existing ground surface. These excavations will extend through the fill and to the native clay and will be above the groundwater level.

The excavations may be undertaken by conventional heavy equipment capable of removing any construction debris within the fill (such as concrete and asphalt pieces).

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils on site are considered to be Type 3 and for open cut excavations, the side slopes of the excavation must be cut back at 1H:1V from the bottom of the excavation. Below the groundwater level, the excavation side slopes are expected to slough and eventually stabilize at a slope of 3H:1V to 2H:1V from the bottom of the excavation.

If side slopes noted above cannot be achieved due to space restrictions on site, such as the proximity of open cut excavations to the property limits, existing infrastructure or to foundations of adjacent existing buildings the excavation for the new building construction would have to be undertaken within the confines of an engineered support system (shoring system).

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 adjacent settlement sensitive structures (buildings) and infrastructure should be monitored for movement (deflection) on a periodic basis during construction operations.

A pre-construction condition survey of buildings and infrastructure within the influence zone of the construction should be undertaken prior to start of construction activities.

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

Base heave type failure is not expected in excavations that extend into the native clay at a maximum 4.0 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

Seepage of the surface and subsurface water into the excavations above the groundwater level is anticipated and it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. High-capacity pumps may be required in zones of persistent seepage where more permeable soil may exist along the side walls of the excavation.

The dewatering of excavations on site during the short-term construction operations is not expected to adversely impact adjacent existing structures and infrastructure.

It is anticipated that groundwater will need to be removed from the excavations. It is noteworthy to mention that 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, Conservation and Parks (MECP) for groundwater takings related to construction dewatering, where taking volumes in excess of 50 m^3/day, but less than 400 m^3/day, and the taking duration was no more than 30 consecutive days. The 2016 legislation replaces the Category 2 PTTW for construction dewatering with a 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 MECP instead of applying for a PTTW.

To be eligible for the new EASR process, the construction dewatering taking must be less than 400 m^3/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 material to be excavated from the site will mainly comprise of silty sand with gravel fill. Portions of the fill (free of organics, roots, cinders, and construction debris) may be re-used as backfill material in the landscaped areas, subject to additional geotechnical evaluation and testing at the 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 engineered fill and for backfilling purposes for this project would have to be imported and should preferably conform to the following specification:

- Engineered fill under footings and slab-on-grade - OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 100 and 98 percent SPMDD respcectively.

- 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.

12. Subsurface Concrete and Steel Requirements

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

Table IV: Results of pH, Chloride, Sulphate and Resistivity Tests on Soil Sample

Borehole No. (Sample No.)	Depth (m)	Soil Type	pH	Sulphate (%)	Chloride (%)	Resistivity (ohm-cm)
BH 1 – SS5	3.0 -3.6	Native Clay	6.51	0.0358	0.141	397

The results indicate the native clay has a sulphate content of less than 0.1 percent. This concentration of sulphate in the native 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.23.1-19. However, the concrete should be dense, well compacted and cured.

Based on a review of the resistivity test result, the native 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. Should specific information be required, including for example, the presence of pollutants, contaminants or other hazards in the soil, refer to the environmental site assessment reports prepared by EXP for this project.

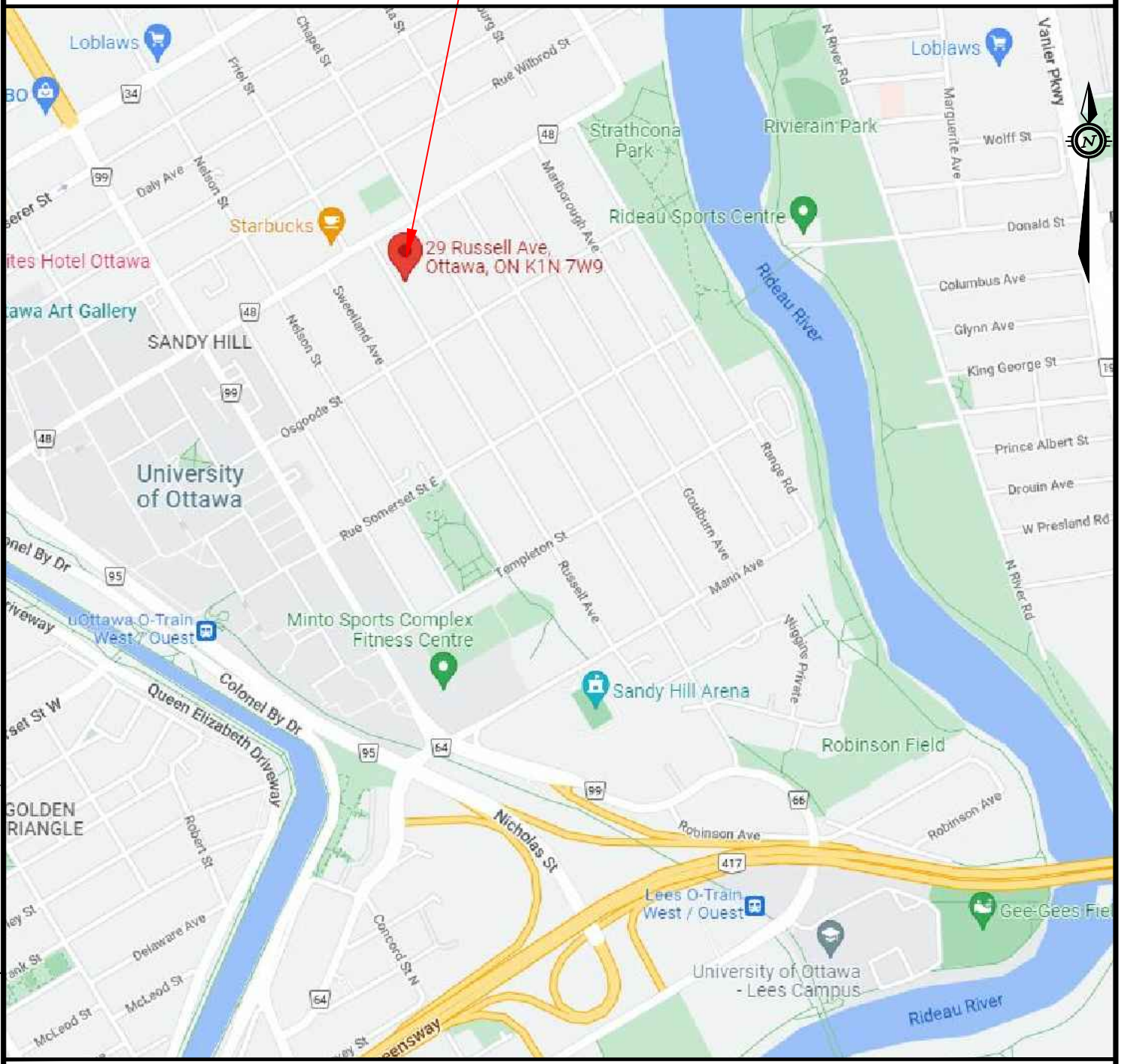
We trust that the information contained in this report is satisfactory for your purposes. Should you have any questions, please contact this office.

Sincerely,

Matthew Zammit, M.A.Sc., P.Eng.
Geotechnical Engineer
Earth and Environment

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

Figures



0 100m 200m 400m

HORIZONTAL 1:10,000

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100-2650 Queensview Drive
Ottawa, ON K2B 8H6
www.exp.com

DESIGN	I.T.
DRAWN	S.H.
DATE	MAR. 2022
FILE NO	OTT-22001495-A0

GEOTECHNICAL INVESTIGATION
PROPOSED ADDITION
23 TO 29 RUSSELL AVE, OTTAWA, ONTARIO

SITE LOCATION PLAN

SCALE 1:10,000

SKETCH NO FIG 1

Filename: E:\OTT\OTT-22001495-A0\60 Execution\65 Drawings\workin drawings\22001495-Figure 1.dwg
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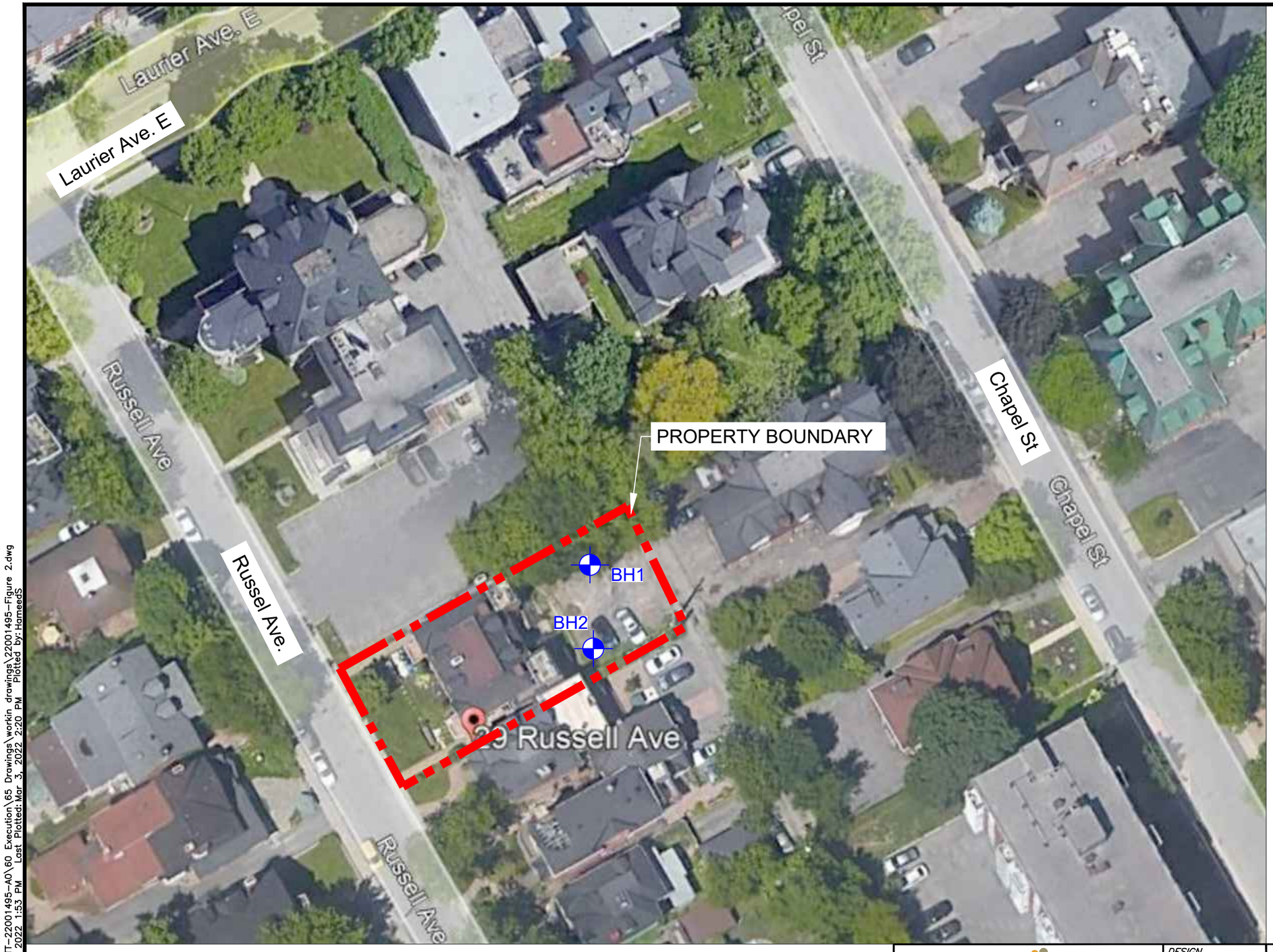

NOTES:

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. GRANULAR FILL AND 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 LOTS GRADES.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.

LEGEND

PROPERTY BOUNDARY

BOREHOLE LOCATION

0 5m 10m 20m

SCALE 1:500

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www.exp.com

DESIGN	I.T.
DRAWN	S.H..
DATE	MAR. 2022
FILE NO	OTT-22001495-A0

GEOTECHNICAL INVESTIGATION
PROPOSED ADDITION
23 TO 29 RUSSELL AVE, OTTAWA, ONTARIO

BOREHOLE LOCATION PLAN

SCALE 1:500

SKETCH NO FIG 2

Filename: E:\OTT\OTT-22001495-A0\60 Execution\65 Drawings\workin drawings\22001495-Figure 2.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 Societv 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.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

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 BH-01

Project No: OTT-22001495-A0

Project: Proposed Addition to Residential Building

Location: 23 to 29 Russell Ave., Ottawa, ON

Figure No. 3

Page. 1 of 2

Date Drilled: 'Feb 23, 2022

Drill Type: Geo-Probe Type Drill Rig (7822DT)

Datum: Depth Below Ground

Logged by: M.Z. Checked by: I.T.

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

GWL	SYMBOL	SOIL DESCRIPTION	Depth Below Ground m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Thin layer of granular over silty sand, some gravel, with organics, cinders, black, moist to wet, frozen in upper level (loose)	0	0			AS1	
			-0.5					
		FILL Silty sand, some gravel, brown, moist (loose)		1	8		SS2	
			-1.8	2	10		SS3	
		SILTY CLAY Grey, moist to wet (firm to very stiff)		3	6		SS4	16.9
					4		SS5	16.9
				4	>170 kPa			
					1		SS6	
				5	83 kPa			
					Hammer Weight		SS7	
				6	83 kPa			
					Hammer Weight		SS8	
				7	-6.5			
				8	43 kPa			
				9	Hammer Weight		SS9	
			-10.0	10	> 80 kPa			

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe was installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-22001495-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	5.3	8.8
Mar 7, 2022	7.1	
May 9, 2022	6.5	

CORE DRILLING RECORD

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

LOG OF BOREHOLE OTT-22001495 - 29 RUSSELL AVE BH LOGS.GPJ TROW OTTAWA.GDT 5/9/22

Log of Borehole BH-01

Project No: OTT-22001495-A0

Project: Proposed Addition to Residential Building

Figure No. 3

GWL	SYMBOL	SOIL DESCRIPTION	Depth Below Ground m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		Dynamic Cone Penetration Test (DCPT) Conducted from 10 m to cone refusal at 14.9 m depth	-10	10	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
				11				
				12				
				13				
				14				
		Cone Refusal at 14.9 m Depth	-14.9					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe was installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-22001495-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	5.3	8.8
Mar 7, 2022	7.1	
May 9, 2022	6.5	

CORE DRILLING RECORD

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

Log of Borehole BH-02

Project No: OTT-22001495-A0

Project: Proposed Addition to Residential Building

Location: 23 to 29 Russell Ave., Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: 'Feb 24, 2022

Drill Type: Geo-Probe Type Drill Rig (7822DT)

Datum: Depth Below Ground

Logged by: M.Z. Checked by: I.T.

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)

Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Depth Below Ground m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Thin layer of granular fill over silty sand, some gravel, with topsoil includions, brown, moist, frozen in upper level (loose)	0	0			AS1	
				1	10		SS2	
			-1.8	2	7		SS3	
		SILTY CLAY Grey, moist to wet (firm to very stiff)			4		SS4	18.0
				3	>170 kPa			
					2		SS5	16.6
				4				
					Hammer Weight		SS6	
				5	> 80 kPa			
					> 80 kPa			
				6				
					Hammer Weight		SS7	
					43 kPa			
			-7.0	7				
		Borehole Terminated at 7.0 m Depth						

LOG OF BOREHOLE OTT-22001495 - 29 RUSSELL AVE BH LOGS.GPJ TROW OTTAWA.GDT 5/9/22

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled 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-22001495-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	no water	3.7

CORE DRILLING RECORD

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

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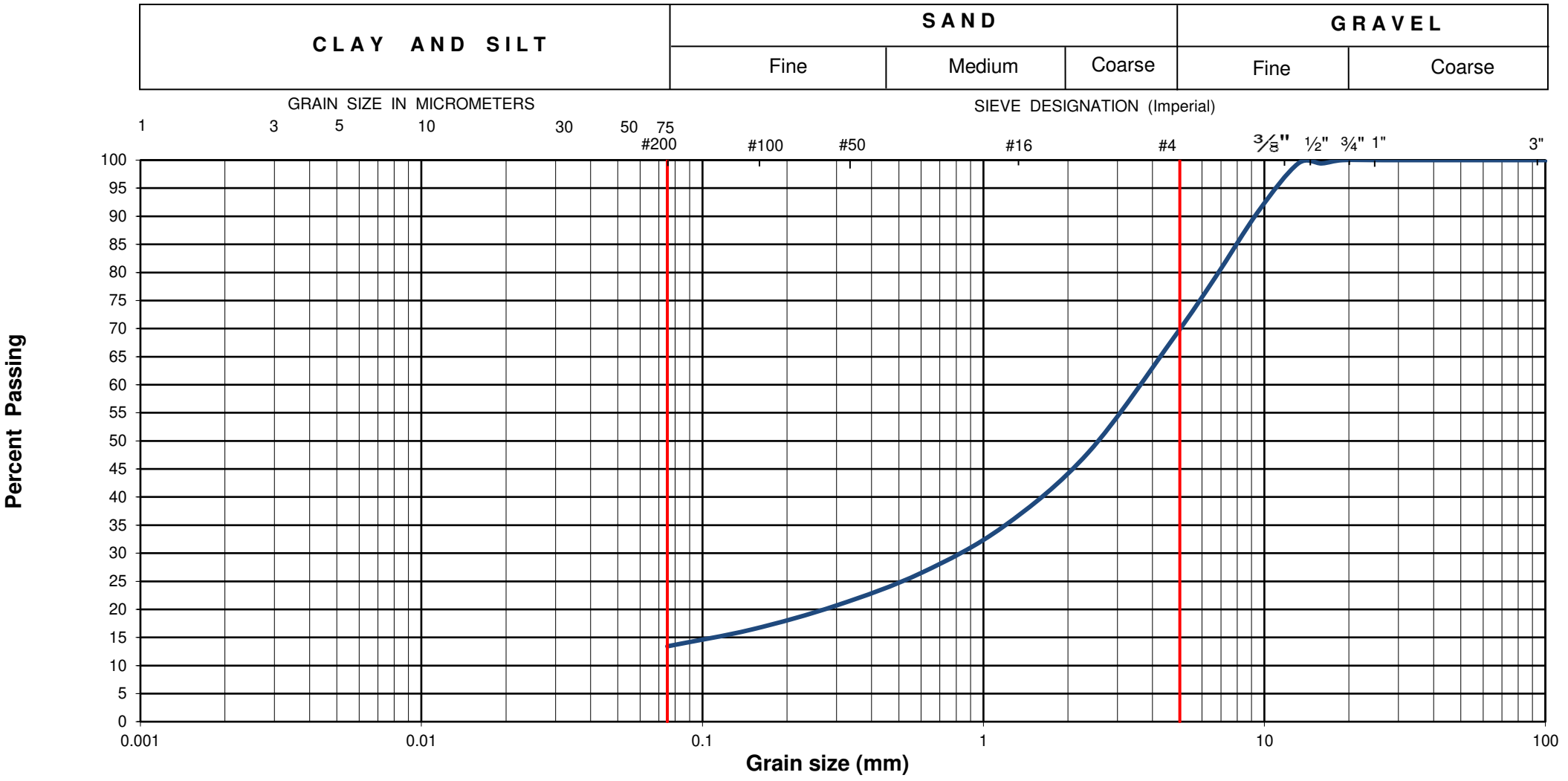
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-22001495-A0**	**Project Name :**	**Geotechnical Investigation - Proposed Addition to Residential Building**						
Client :	**Smart Living Properties**	**Project Location :**	**23 to 29 Russell Ave, Ottawa, ON**						
Date Sampled :	**February 24, 2022**	**Borehole No:**	**BH2**	**Sample:**	**AS1**	**Depth (m) :**	**0-0.6**		
Sample Composition :		**Gravel (%)**	**32**	**Sand (%)**	**55**	**Silt & Clay (%)**	**13**	**Figure :**	**5**
Sample Description :	**GRANULAR FILL: Silty Sand with Gravel (SM)**								

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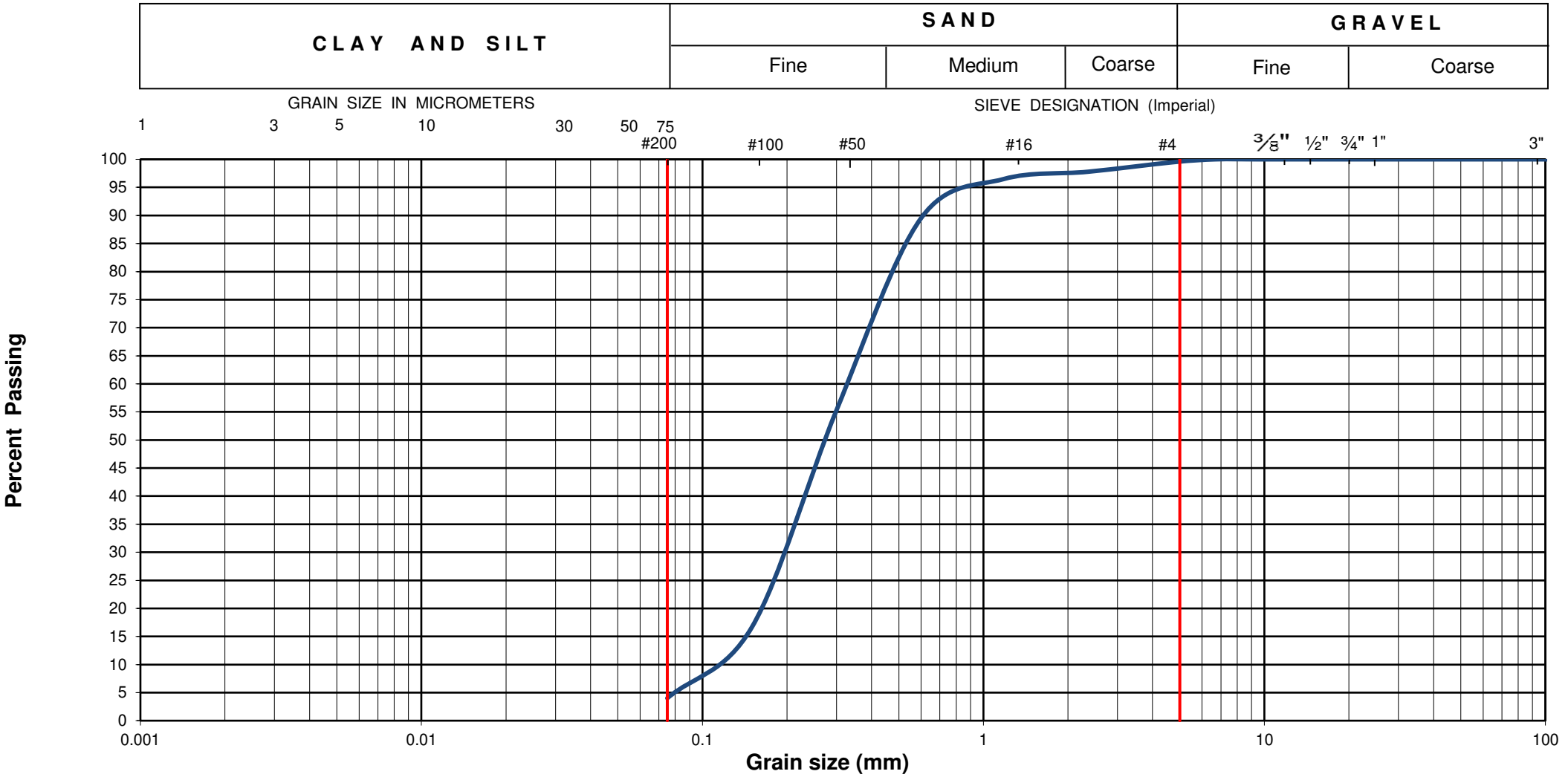
Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-22001495-A0**	**Project Name :**	**Geotechnical Investigation - Proposed Addition to Residential Building**						
Client :	**Smart Living Properties**	**Project Location :**	**23 to 29 Russell Ave, Ottawa, ON**						
Date Sampled :	**February 23, 2022**	**Borehole No:**	**BH1**	**Sample:**	**SS3**	**Depth (m) :**	**1.5-2.1**		
Sample Composition :		**Gravel (%)**	**1**	**Sand (%)**	**95**	**Silt & Clay (%)**	**4**	**Figure :**	**6**
Sample Description :	**FILL: Poorly Graded Sand (SP)**								

EXP Services Inc.
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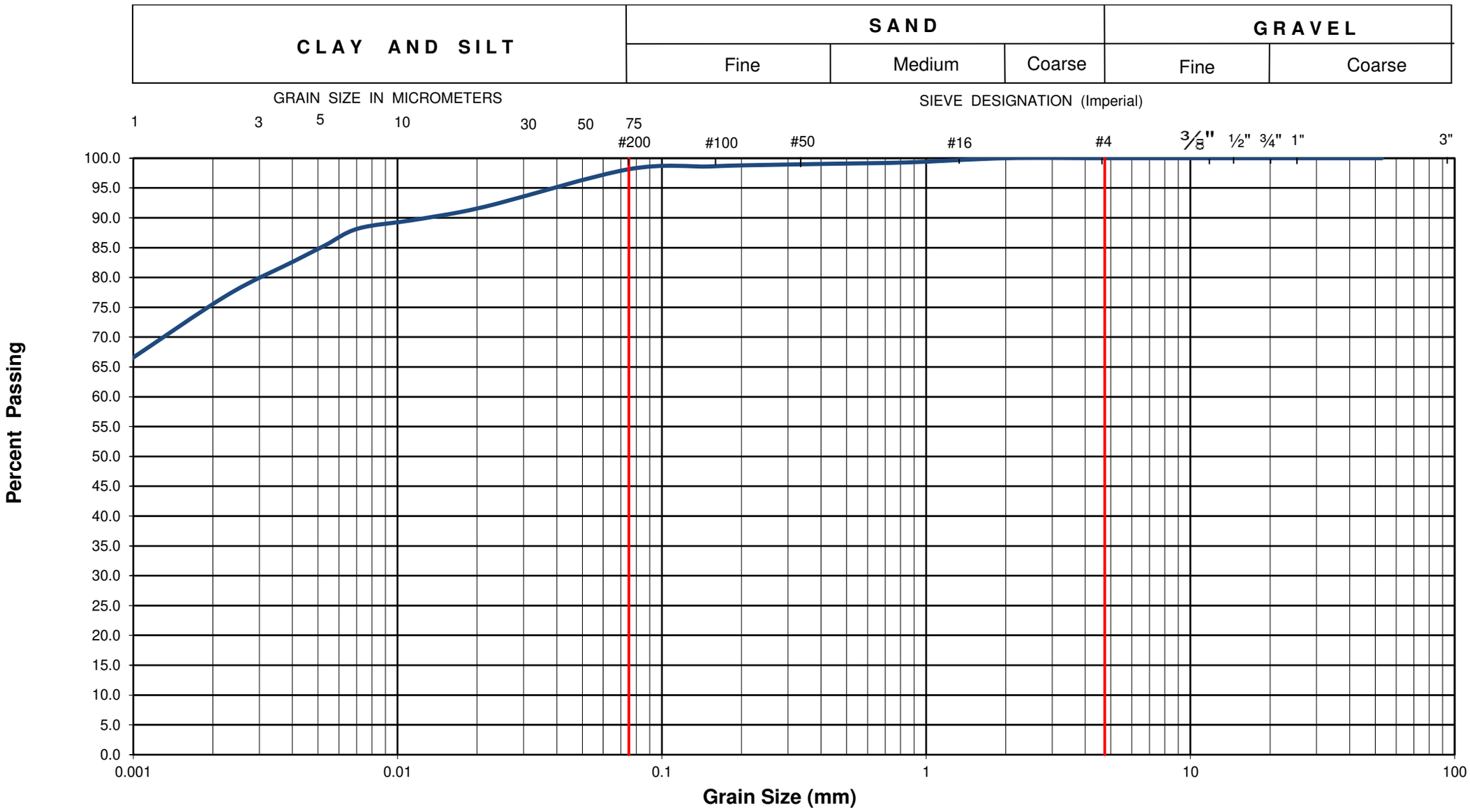
Ottawa, ON K2B 8H6

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

Unified Soil Classification System



EXP Project No.:	**OTT-22001495-A0**	**Project Name :**	**Geotechnical Investigation - Proposed Addition to Residential Building**						
Client :	**Smart Living Properties**	**Project Location :**	**23 to 29 Russell Ave, Ottawa, ON**						
Date Sampled :	**February 23, 2022**	**Borehole No:**	**BH1**		**Sample No.:**	**SS4**		**Depth (m) :**	**2.3-2.9**
Sample Description :		**% Silt and Clay**	**98**	**% Sand**	**2**	**% Gravel**	**0**	**Figure :**	**7**
Sample Description :		**Clay of High Plasticity (CH)**							

Appendix A:
Laboratory Certificate of Analysis

AGAT Laboratories

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**
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899

ATTENTION TO: **Matthew Zammit**

PROJECT: **OTT-22001495-A0**

AGAT WORK ORDER: **22Z868746**

SOIL ANALYSIS REVIEWED BY: **Nivine Basily, Inorganics Report Writer**

DATE REPORTED: **Mar 09, 2022**

PAGES (INCLUDING COVER): **5**

VERSION*: **1**

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

Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
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- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22Z868746

PROJECT: OTT-22001495-A0

CLIENT NAME: EXP SERVICES INC

SAMPLING SITE:23 Russel Ave. Ottawa

ATTENTION TO: Matthew Zammit

SAMPLED BY:EXP

Inorganic Chemistry (Soil)

DATE RECEIVED: 2022-03-01 **DATE REPORTED: 2022-03-09**

				BH#1 SS5
		SAMPLE DESCRIPTION:		10'-12'
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2022-02-23
Parameter	Unit	G / S	RDL	3572413
Chloride (2:1)	µg/g		2	1410
Sulphate (2:1)	µg/g		2	358
pH (2:1)	pH Units		NA	6.51
Electrical Conductivity (2:1)	mS/cm		0.005	2.52
Resistivity (2:1) (Calculated)	ohm.cm		1	397

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

3572413 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.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 22Z868746

PROJECT: OTT-22001495-A0

ATTENTION TO: Matthew Zammit

SAMPLING SITE:23 Russel Ave. Ottawa

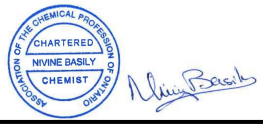
SAMPLED BY:EXP

Soil Analysis

RPT Date: Mar 09, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
Chloride (2:1)	3575544		30	30	0.0%	< 2	103%	70%	130%	109%	80%	120%	108%	70%	130%
Sulphate (2:1)	3575544		85	86	1.2%	< 2	99%	70%	130%	104%	80%	120%	102%	70%	130%
pH (2:1)	3572413	3572413	6.51	6.69	2.7%	NA	99%	80%	120%						
Electrical Conductivity (2:1)	3572413	3572413	2.52	2.63	4.3%	< 0.005	109%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By:



AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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

Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 22Z868746

PROJECT: OTT-22001495-A0

ATTENTION TO: Matthew Zammit

SAMPLING SITE:23 Russel Ave. Ottawa

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	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION

Results relate only to the items tested. Results apply to samples as received.

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

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: Matthew Zammit
Address: 2650 Queensview Dr. Unit 100
Ottawa, ON, K2B 8H6
Phone: 613-688-1899 Fax:
Reports to be sent to:
1. Email: matthew.zammit@exp.com
2. Email:

Project Information:

Project: OTT-22001495-A0
Site Location: 23 Russel ave. Ottawa
Sampled By: EXP
AGAT ID #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Excess Soils R406
Table _____ *Indicate One*
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐ Sanitary ☐ Storm
_____ *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Sample Matrix Legend

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

Laboratory Use Only

Work Order #: 22786874 6
Cooler Quantity: n/a - bag / 1 small
Arrival Temperatures: 19.9 | 18.9 | 18.8
0.3 | 0.4 | 0.0
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: Ice Pack

Turnaround Time (TAT) Required:

Regular TAT *(Most Analysis)* ☑ 5 to 7 Business Days
Rush TAT *(Rush Surcharges Apply)*
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs; Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: Total PCBs ☐ Aroclor	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR							Potentially Hazardous or High Concentration (Y/N)
BH#1 SS5 10-12'	Feb. 23/22	AM PM	1	S													pH ✓	Sulphate ✓	Chloride ✓	Electrical resistivity ✓		
		AM PM																				
		AM PM																				
		AM PM																				
		AM PM																				
		AM PM																				
		AM PM																				
		AM PM																				
		AM PM																				
		AM PM																				

Samples Relinquished By (Print Name and Sign): Jeff MacMillan	Date: March 1/22	Time: 3:45 PM	Samples Received By (Print Name and Sign): C. Griffiths	Date: 22/03/01	Time: 15h50
Samples Relinquished By (Print Name and Sign): C. Groenendijk	Date: 22/03/01	Time: 16h00	Samples Received By (Print Name and Sign): Anthony Dasilva	Date:	Time:
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

'22 MAR 2 9:20 AM

Appendix B:
Legal Notification

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.

Report Distribution

Jeremy Silburt - Jeremy@SmartLivingProperties.ca