Geotechnical Investigation Report
Proposed Addition to Alexander Community Centre
960 Silver Street
Ottawa, Ontario

Client:
City of Ottawa
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Type of Document:
Final Report

Project Number:
OTT-23011957-Q0

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Date Submitted:
March 26,2026

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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 Alexander Community Centre building located in Alexander Park, 960 Silver Street, Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by the City of Ottawa.

Proposed Development

It is our understanding that the proposed new addition to the Alexander Community Centre building will be located on the north side of the existing building and will be a slab-on-grade construction with no basement. Further, it is our understanding that the existing building is supported by footings and has a partial basement located along the north side of the existing building and that the lower footings for the partial basement are assumed to be founded at a 2.0 m depth below existing grade. The expansion of the community centre will also include increasing the area of the parking lot and associated access road to the south towards Shillington Avenue.

Phase One and Two Environmental Site Assessments (ESAs) of the site were undertaken in conjunction with this geotechnical investigation and the results are reported under separate cover.

Fieldwork Program

The borehole fieldwork was undertaken on November 10 and 11, 2025 and on January 23,2026 and consists of seven (7) boreholes (Borehole Nos. 25-01, 26-01A and 25-02 to 25-06). Borehole Nos. 25-01, 26-01A, 25-02 and 25-03 are located within the footprint of the proposed addition for the community centre and extend to termination and dynamic cone refusal depths ranging from 7.5m to 13.7 m below existing grade. The remaining boreholes, Borehole Nos. 25-04 to 25-06, are located within the footprint of the proposed new paved parking lot and access road areas and extend to termination depths of 1.8 m to 5.2 m below existing grade. The borehole fieldwork was supervised on a full-time basis by a representative from EXP.

A shear wave velocity sounding survey was conducted on the site on January 27,2026 by Geophysics GPR International Inc. (GPR). The purpose of the survey was to determine the site designation and site classification for seismic design. The shear wave velocity sounding survey was undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The shear wave velocity sounding report by GPR is shown in Appendix A of the attached geotechnical report.

Subsurface Conditions

The borehole information indicates that beneath a surficial topsoil layer and pavement structure, the site is underlain by stiff to hard silty clay followed by a weaker very loose to compact glacial till. The groundwater level ranges from 3.1 m to 3.7 m depths below existing ground surface (Elevation 75.0 m and Elevation 74.9 m).

Geotechnical Comments and Recommendations

Site Designation and Classification for Seismic Design and Liquefaction Potential of Soils

The results of the shear wave velocity sounding survey indicate the average shear wave velocity measurement in the top 30.0 m, V_{s30}, is 650 m/s. As per Section 4.1.8.4 of the 2024 Ontario Building Code (OBC), where a shear wave velocity sounding survey was undertaken, the site designation is defined as X_{Vs30}. The site designation based on site class for V_{s30} values is shown in Table 4.1.8.4.-B of the 2024 OBC. Therefore, for this site, the site designation based on the measurements from the shear wave velocity sounding survey is considered to be X_{650}. The site designation based on site class is X_C; equivalent site class is C. Section 4.1.8.4 of the 2024 OBC indicates that for sites where a shear wave velocity sounding survey was undertaken to measure the V_{s30} value, the site designation may be used

for seismic design, since the site designation will typically result in a lower seismic demand compared with using the site designation based on site class (X_c). Therefore, for this project, a site designation of X_{650} may be used for seismic design. The subsurface soils are considered not to be liquefiable during a seismic event.

Grade Raise Restrictions

Since the site is already developed and occupied by the existing park and community centre development, a raise in the site grades is not anticipated for this project. Therefore, it is assumed there will be no grade raise at the site for this project.

Foundation Considerations

Borehole Nos. 25-01, 26-01A, 25-02 and 25-03 are located within the footprint of the proposed addition to the community centre and indicate the subsurface soil conditions consist of fill, underlain by stiff to hard silty clay followed by very loose to compact glacial till. The groundwater level in Borehole Nos. 25-01 and 25-02 is at 3.3 m and 3.7 m depths (Elevation 75.0 m and Elevation 74.9 m).

Based on a review of the borehole information, the proposed addition to the community centre may be supported by strip and spread footings founded on the stiff to hard silty clay. The existing topsoil layer, pavement structure (including the fill) and the fill beneath the topsoil layer are considered not suitable to support the footings and slab-on-grade of the proposed community centre addition.

Strip footings having a maximum width of 1.5 m and square pad footings having a maximum width and length of 3.0 m and founded to a maximum 2.0 m depth below existing grade on the stiff to hard silty clay may designed for a bearing pressure at serviceability limit state (SLS) of 120 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 180 kPa. The factored geotechnical resistance at ULS for footings includes a geotechnical resistance factor of 0.5. The total and differential settlement of footings designed in accordance with the recommendations of this report and with careful attention to construction detail are expected to be within normally tolerated limits of 25 mm total and 19 mm differential movements.

It is recommended that the new footings located along the north wall of the existing community centre and next to the existing footings be founded at the same depth as the existing footing.

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

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 where the snow will be removed from the vicinity of the structure. When earth cover is less than the required cover, an equivalent thermal combination of earth cover and rigid insulation or rigid insulation alone should be provided.

Slab-on-Grade Constructions and Drainage Requirements

It is assumed that the ground floor of the proposed addition will match the ground floor of the existing community centre that is located near existing grade. The floor slab for the community centre addition may be designed and constructed as a slab-on-grade placed on a 200 mm thick 19 mm sized clear stone bed placed on a minimum 300 mm thick engineered fill pad constructed in accordance with Section 7 of the attached geotechnical report. The clear stone would minimize the capillary rise of moisture from the sub-soil to the floor slab. As an alternative to the clear stone layer, the floor slab may be cast on a 200 mm thick bed of OPSS Granular A overlain by a vapour barrier. Adequate saw cuts should be provided in the floor slabs to control cracking.

It is recommended that a perimeter drainage system be installed around the proposed addition to the community centre. If a perimeter drainage system is encountered along the existing community centre building during the

construction of the addition, it should be reinstated. An underfloor drainage system is not required for the proposed community centre addition.

Excavation and De-Watering Requirements

Excavations for the proposed community centre addition and for the installation of underground services are anticipated to extend to an approximate maximum 3.0 m depth below existing grade. The excavations will extend through the pavement structure, topsoil, fill and into the silty clay and glacial till. Based on the groundwater level measurements, the excavations may be above or below the groundwater level.

Excavations may be undertaken using conventional heavy equipment.

Open cut excavation within the subsurface soils should comply with the most recent Occupational Health and Safety Act (OHSA), Ontario Regulations 213/91 (August 1, 1991). Based on the definitions contained in OHSA, the subsurface soils at the site are classified as Type 3 soil and as such the excavation sidewalls must be cut back at 1H:1V from the bottom of the excavation. Below the groundwater table, the excavation side slopes are expected to slough and will eventually stabilize at a slope of 2H:1V to 3H:1V from the bottom of the excavation. For properly dewatered excavations, the installation of municipal underground services may be undertaken within the confines of a prefabricated support system (trench box) designed and installed in accordance with OHSA.

Excavations that extend to the glacial till or terminate in the glacial till that is below the groundwater level may be susceptible to instability of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction to be undertaken under relatively dry conditions, it will be necessary to lower the groundwater table to below the final excavation depth prior to start of excavation. This may be achieved by installing deep sumps and pumping with high-capacity pumps on a continuous basis. The groundwater level should be lowered and maintained to 1.0 m below the bottom of the excavation until construction below grade has been completed. The contractor should determine the most appropriate dewatering method for the given site conditions and for the construction to be undertaken in relatively dry conditions.

Excavations that terminate within the stiff to hard silty clay are not expected to experience base-heave type failure.

Backfilling Requirements

It is anticipated that the majority of the material required for backfilling purposes, interior and exterior to the proposed buildings and for service trench backfill would have to be imported and should preferably conform to the specifications discussed in the attached geotechnical report.

Additional Test Pits

Test pits should be undertaken along the north wall of the existing building to confirm the depth of the existing footings. Based on the findings from the test pits, the geotechnical engineering comments and recommendations provided in this report will need to be updated. Alternatively, a geotechnical memorandum can be issued providing updated geotechnical comments and recommendations based on the findings from the test pits.

Closure

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

This executive summary is a brief synopsis of the attached geotechnical report and should not be read in lieu of reading the attached geotechnical report in its entirety.

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed addition to the existing Alexander Community Centre building located in Alexander Park, 960 Silver Street, Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by the City of Ottawa.

It is our understanding that the proposed new addition to the Alexander Community Centre building will be located on the north side of the existing building and will be a slab-on-grade construction with no basement. Further, it is our understanding that the existing building is supported by footings and has a partial basement located along the north side of the existing building and that the lower footings for the partial basement are assumed to be founded at a 2.0 m depth below existing grade. The expansion of the community centre will also include increasing the area of the parking lot and associated access road to the south towards Shillington Avenue.

Phase One and Two Environmental Site Assessments (ESAs) of the site were undertaken in conjunction with this geotechnical investigation and the results are reported under separate cover.

This geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at seven (7) boreholes located on the site,

b) Provide site designation and site classification for seismic design in accordance with the requirements of the 2024 Ontario Building Code and assess the potential for liquefaction of the subsurface soils during a seismic event,

c) Comment on grade-raise restrictions,

d) Provide comments regarding site grading requirements,

e) Make recommendations regarding the most suitable type of foundations, founding depth and bearing pressure at serviceability limit state (SLS) and factored geotechnical resistance at ultimate limit state (ULS) of the founding strata for the proposed community centre addition and comment on the anticipated total and differential settlements of the recommended foundation type,

f) Provide comments regarding slab-on-grade construction and the requirements for perimeter and underfloor drainage systems,

g) Comment on excavation conditions and de-watering requirements during construction,

h) Provide pipe bedding requirements for underground services,

i) Discuss backfilling requirements and suitability of on-site soils for backfilling purposes,

j) Recommend pavement structure thicknesses for the proposed new parking lot and access road areas,

k) Comment on the corrosion potential of the subsurface soils to buried concrete and steel; and

l) Discuss tree planting restrictions.

The comments and recommendations given in this report are based on the assumption that the above-described design concepts 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

At the time of the geotechnical investigation, the site, Alexander Park, was occupied by the existing community centre building, outdoor wading pool, skating rink, soccer field, and playground with a parking lot.

The topography of the site is relatively flat with ground surface elevations at the borehole locations of Elevation 78.67 m to Elevation 78.07 m.

3. Procedure

3.1 Borehole Fieldwork

The borehole fieldwork was undertaken on November 10 and 11, 2025 and on January 23,2026 and consists of seven (7) boreholes (Borehole Nos. 25-01, 26-01A and 25-02 to 25-06). Borehole Nos. 25-01, 26-01A, 25-02 and 25-03 are located within the footprint of the proposed addition to the community centre building and extend to termination and dynamic cone refusal depths ranging from 7.5m to 13.7 m below existing grade. The remaining boreholes, Borehole Nos. 25-04 to 25-06, are located within the footprint of the proposed new paved parking lot and access road areas and extend to termination depths of 1.8 m to 5.2 m below existing grade. The borehole fieldwork was supervised on a full-time basis by a representative from EXP.

The locations and geodetic elevations of the boreholes were established on site by EXP and are shown on the Borehole Location Plan, Figure 2.

The boreholes were cleared of private and public underground services, prior to the start of drilling operations. The boreholes were drilled using a Geo-Probe and CME-75 truck-mounted drill rig equipped with continuous flight hollow stem augers and soil sampling and rock coring capabilities. Standard penetration tests (SPTs) were performed in all the boreholes at depth intervals of 0.75 m to 1.5 m with soil samples retrieved by the split-barrel sampler. Borehole No. 26-01A was advanced by casing and wash-boring method. The undrained shear strength of the silty clay was measured by conducting in-situ vane tests at selected depths in the boreholes. A dynamic cone penetration test (DCPT) was conducted in one (1) borehole. Conventional rock coring technique had to be used to advance Borehole No. 26-01A through cobbles and boulders within the glacial till.

A fifty (50) mm diameter monitoring well with screened section was installed in selected boreholes for long-term monitoring of the groundwater levels and for the purpose of obtaining groundwater samples for analysis as part of the Phase Two ESA. The monitoring wells were installed in accordance with EXP standard practice. The installation configuration is documented on the respective borehole log. The boreholes were backfilled upon completion of drilling and the installation of the monitoring wells.

On completion of the fieldwork, the soil samples were transported to the EXP laboratory in Ottawa. Soil classification consisted of classifying the main constituents of the soils in accordance with the Unified Soil Classification System (USCS) using the soil group name and symbol and by the modified Burmister Soil Classification System for the classification of the minor constituents of the soil using modifiers and adjectives (such as trace and some).

3.2 Shear Wave Velocity Sounding Survey

A shear wave velocity sounding survey was conducted on the site on January 27,2026 by Geophysics GPR International Inc. (GPR). The purpose of the survey was to determine the site designation and site classification for seismic design. The shear wave velocity sounding survey was undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The shear wave velocity sounding survey report by GPR is shown in Appendix A.

3.3 Laboratory Testing Program

The laboratory testing program for the soil samples is summarized in Table I.

Table I: Summary of Laboratory Testing Program	
Type of Test	Number of Tests Completed
Moisture Content Determination	43
Grain Size Analysis	4
Atterberg Limit Determination	2
Corrosion Analysis Package (pH, sulphate, chloride and resistivity)	1

4. Subsurface Conditions and Groundwater Levels

A detailed description of the subsurface conditions and groundwater levels from the boreholes are given on the attached borehole logs, Figures 3 to 9. 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 also may result in changes in the conditions interpreted to exist at the locations where sampling was conducted.

Boreholes were drilled to provide representation of subsurface conditions as part of a geotechnical exploration program and are not intended to provide evidence of potential environmental conditions. Reference is made to the EXP Phase One and Two ESA reports regarding the potential environmental conditions of the site.

It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling operations. These boundaries 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 form 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 Pavement Structure

Borehole Nos. 25-01, 26-01A, 25-05 and 25-06 are located in a paved area where the pavement structure consists of 25 mm to 75 mm thick asphaltic concrete underlain by 200 mm to 675 mm thick granular fill base. Locally, in Borehole No. 26-01A, the granular fill is 1375 mm thick and may consist of a mixture of granular fill that forms part of the pavement structure and underlying fill. The granular fill comprises of silty sand with trace gravel and clay pockets. In Borehole No. 25-06, the granular fill contains asphalt fragments. Based on the standard penetration test (SPT) N-values of 6 to 20, the granular fill is in a loose to compact state. The moisture content of the granular fill ranges from 7 percent to 17 percent.

4.2 Topsoil

A 75 mm to 180 mm thick surficial topsoil layer was encountered in Borehole Nos. 25-02 to 25-04.

4.3 Fill

Fill was contacted below the pavement structure and surficial topsoil layer in Borehole Nos. 25-02 to 25-06. The fill extends to depths ranging from 0.8 m to 1.4 m below existing grade (Elevation 77.5 m to Elevation 77.1 m). The fill consists of silty sand with clay pockets. Based on the SPT N-values of 3 to 13, the fill is in a very loose to compact state. The moisture content of the fill is 10 percent to 43 percent.

4.4 Silty Clay

The topsoil and fill are underlain by a sensitive marine silty clay contacted in all six (6) boreholes at a 0.7 m to 1.4 m depths (Elevation 77.6 m to Elevation 76.9 m). The marine clay consists of an upper desiccated brown silty clay crust underlain by a lower strength un-desiccated grey silty clay.

4.4.1 Upper Brown Desiccated Silty Clay Crust

The upper desiccated brown silty clay crust was contacted in all boreholes and extends to depths of 2.1 m to 3.6 m (Elevation 76.1 m to Elevation 74.7 m). The undrained shear strength of the crust ranges from 60 kPa to greater than 250 kPa indicating a stiff to hard consistency. The natural moisture content of the silty clay crust is 40 percent to 50 percent.

The results from the grain-size analysis conducted on one (1) sample of silty clay are summarized in Table II. The grain-size distribution curve is shown in Figure 10.

Table I: Summary of Results from Grain-Size Analysis and Atterberg Limit Determination
Brown Silty Clay Crust

Borehole No. (BH) -Sample No. (SS)	Depth (m)	Grain-Size Analysis (%)				Atterberg Limits (%)				
		GR	SA	Silt	Clay	MC	LL	PL	PI	Soil Classification
BH 25-02 (SS3)	1.5-2.1	0	2	25	73	40	78	29	49	Silty Clay of High Plasticity (CH) – Trace Sand

GR= Gravel, SA= Sand, MC = Moisture Content, LL = Liquid Limit, PL Plastic Limit, PI= Plasticity Index

Based on a review of the results from the grain size analysis, the soil may be classified as a silty clay of high plasticity (CH) with trace sand.

4.4.2 Lower Grey Silty Clay

The lower un-desiccated grey silty clay was contacted in all boreholes except Borehole Nos. 25-01, 26-01A and 25-06 at 2.1 m to 2.6 m depths (Elevation 76.1 m and Elevation 76.0 m) and extends to depths ranging from 3.6 m and 4.3 m (Elevation 74.6 to Elevation 74.3 m). The undrained shear strength of the silty clay to clay ranges from 78 kPa to 91 kPa indicating the silty clay has a stiff consistency. The grey silty clay has natural moisture contents of 45 percent to 62 percent.

The results from the grain-size analysis and Atterberg limit determination conducted on one (1) sample of the grey silty clay are summarized in Table III. The grain-size distribution curve is shown in Figure 11.

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

Borehole No. (BH) -Sample No. (SS)	Depth (m)	Grain-Size Analysis (%)				Atterberg Limits (%)				
		GR	SA	Silt	Clay	MC	LL	PL	PI	Soil Classification
BH 25-02 (SS4)	3.0-3.6	0	2	41	57	45	56	23	33	Silty Clay of High Plasticity (CH): Trace Sand

GR= Gravel, SA= Sand, MC = Moisture Content, LL = Liquid Limit, PL Plastic Limit, PI= Plasticity Index

Based on a review of the results from the grain size analysis, the soil may be classified as a silty clay of high plasticity (CH) with trace sand.

4.5 Glacial Till

Glacial till was encountered below the silty clay in Borehole Nos. 25-01, 26-01A and 25-02 to 25-04. The glacial till was contacted at 2.7 m to 4.3 m depths (Elevation 75.6 m to Elevation 74.3 m). The glacial till consists of silty sand with varying percentages of gravel and clay. In Borehole No. 26-01A, the glacial till becomes 'cobbly and bouldery' containing numerous cobbles and boulders below a 9.1 m depth (Elevation 69.2 m). Borehole No. 26-01A terminated within the 'cobbly and bouldery' glacial till at a 13.7 m depth (Elevation 64.6 m). Based on the SPT N-values of 1 to 8, the glacial till is in a very loose to loose state. The natural moisture content of the glacial till ranges from 8 percent to 17 percent.

The results from the grain-size analysis conducted on two (2) samples of the glacial till are summarized in Table IV. The grain-size distribution curves are shown in Figures 12 and 13.

Table IV: Summary of Results from Grain-Size Analysis – Glacial Till

Borehole No. (BH) - Sample No. (SS)	Depth (m)	Grain-Size Analysis (%)				
		Gravel	Sand	Silt	Clay	Soil Classification
BH 25-01 (SS6)	4.6-5.2	13	46	31	10	Silty Sand (SM): Some Gravel, Trace Clay
BH 25-02 (SS8)	6.9-7.5	10	51	29	10	Silty Sand (SM): Trace Gravel and Clay

Based on a review of the results from the grain size analysis, the glacial till may be classified as a silty sand (SM) with trace to some gravel and trace clay.

4.6 Inferred Cobbles, Boulders or Bedrock

A dynamic cone penetration test (DCPT) was conducted from a 7.5 m depth (Elevation 70.7 m) to a cone refusal depth of 11.5 m (Elevation 66.7 m) in Borehole No. 25-03 on inferred cobbles, boulders or bedrock. Based on the information from Borehole No. 26-01A, it is likely that cone refusal was met on cobbles and boulders within the 'cobbly and bouldery' glacial till.

4.7 Groundwater Level Measurements

A summary of the groundwater level measurements taken on November 26,2025 in the boreholes equipped with monitoring wells is summarized in Table V.

Table V: Summary of Groundwater Level Measurements

Borehole No. (BH/MW)	Ground Surface Elevation (m)	Elapsed Time in Days from Date of Installation to Date of Measurement	Depth Below Ground Surface (Elevation), m
BH/MW25-01	78.26	15 days	3.3 (75.0)
BH/MW 25-02	78.59	16 days	3.7(74.9)
BH/MW 25-04	78.07	15 days	3.1 (75.0)

The groundwater level ranges from 3.1 m to 3.7 m depths below existing ground surface (Elevation 75.0 m and Elevation 74.9 m).

The groundwater levels were determined in the boreholes at the time and under the condition stated in this report. 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. Site Designation and Classification for Seismic Design and Liquefaction Potential of Subsurface Soils

A shear wave velocity sounding survey was conducted on the site on January 27,2026 by Geophysics GPR International Inc. (GPR). The purpose of the survey was to determine the site designation and site classification for seismic design. The shear wave velocity sounding survey was undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The shear wave velocity sounding survey report by GPR is shown in Appendix A.

The results of the survey indicate the average shear wave velocity measurement in the top 30.0 m, V_{s30} , is 650 m/s. As per Section 4.1.8.4 of the 2024 Ontario Building Code (OBC), where a shear wave velocity sounding survey was undertaken, the site designation is defined as X_{Vs30} . The site designation based on site class for V_{s30} values is shown in Table 4.1.8.4.-B of the 2024 OBC. Therefore, for this site, the site designation based on the measurements from the shear wave velocity sounding survey is considered to be X_{650}. The site designation based on site class is X_C; equivalent site class is C. Section 4.1.8.4 of the 2024 OBC indicates that for sites where a shear wave velocity sounding survey was undertaken to measure the V_{s30} value, the site designation may be used for seismic design, since the site designation will typically result in a lower seismic demand compared with using the site designation based on site class (X_c). Therefore, for this project, a site designation of X_{650} may be used for seismic design.

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

6. Grade Raise Restrictions

Since the site is already developed and occupied by the existing park and community centre development, a raise in the site grades is not anticipated for this project. Therefore, it is assumed there will be no grade raise at the site for this project.

If there will be a grade raise at the site, EXP should be contacted to review and determine the suitability of the new grade raise and the impact the site grade raise may have on the bearing pressure at serviceability limit state (SLS) and factored geotechnical resistance at ultimate limit state (ULS) for the footings discussed in section 8 of this geotechnical report.

7. Site Grading

Site grading within the **proposed building addition footprint** and for slab-on-grade construction should consist of the removal of all existing asphalt and topsoil layers, fill and organic stained soils down to the undisturbed silty clay. The silty clay subgrade should be proofrolled and examined by a geotechnician. Any loose or soft areas identified during proofrolling operations should be subexcavated and removed and replaced with OPSS Granular B Type II compacted to 98 percent standard Proctor maximum dry density (SPMDD). Once the subgrade has been approved, the grades may be raised to the underside of the floor slab by the construction of a minimum 300 mm thick engineered fill pad consisting of Ontario Provincial Standard Specification (OPSS) Granular B Type II material compacted to 98 percent SPMDD.

Site grading within the **proposed parking lot and access road** areas should consist of the removal of all existing topsoil and asphalt layers and organic stained soils. The exposed subgrade should be proofrolled in the presence of geotechnician. Any loose or soft areas identified during proofrolling operations should be subexcavated and removed and replaced with OPSS Granular B Type II compacted to 95 percent SPMDD. Once the subgrade has been approved, the grades may be raised to the design subgrade level using Ontario Provincial Standard Specification (OPSS) Granular B Type II or OPSS Select Subgrade Material (SSM) compacted to 95 percent standard Proctor maximum dry density (SPMDD). Alternatively, portions of the excavated silty clay from above the groundwater table may be reused to raise the site grades to the design subgrade level of the pavement structure. The suitability of re-using the silty clay to raise the grades will have to be further assessed at time of construction by examining this material and conducting additional tests on the material.

In place density tests should be performed on each lift of placed material to ensure that it has been compacted to the project specifications.

8. Foundation Considerations

It is our understanding that the proposed new addition to the Alexander Community Centre building will be located on the north side of the existing building and will be a slab-on-grade construction with no basement. Further, it is our understanding that the existing building is supported by footings and has a partial basement located along the north side of the existing building and that the lower footings for the partial basement are assumed to be founded at a 2.0 m depth below existing grade.

Borehole Nos. 25-01, 26-01A, 25-02 and 25-03 are located within the footprint of the proposed addition to the community centre and indicate the subsurface soil conditions consist of fill, underlain by stiff to hard silty clay followed by very loose to compact glacial till. The groundwater level in Borehole Nos. 25-01 and 25-02 is at 3.3 m and 3.7 m depths (Elevation 75.0 m and Elevation 74.9 m).

Based on a review of the borehole information, the proposed addition to the community centre may be supported by strip and spread footings founded on the stiff to hard silty clay. The existing topsoil layer, pavement structure (including the fill) and the fill beneath the topsoil layer are considered not suitable to support the footings and slab-on-grade of the proposed community centre addition.

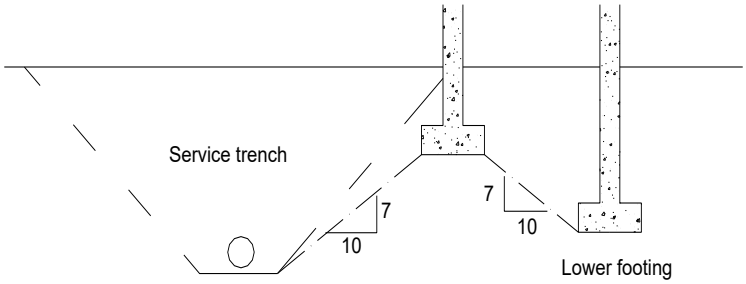
Strip footings having a maximum width of 1.5 m and square pad footings having a maximum width and length of 3.0 m and founded to a maximum 2.0 m depth below existing grade on the stiff to hard silty clay may designed for a bearing pressure at serviceability limit state (SLS) of 120 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 180 kPa. The factored geotechnical resistance at ULS for footings includes a geotechnical resistance factor of 0.5. The total and differential settlement of footings designed in accordance with the recommendations of this report and with careful attention to construction detail are expected to be within normally tolerated limits of 25 mm total and 19 mm differential movements.

It is recommended that the new footings located along the north wall of the existing community centre and next to the existing footings be founded at the same depth as the existing footing.

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

Test pits should be undertaken along the north wall of the existing building to confirm the depth of the existing footings. Based on the findings from the test pits, the geotechnical engineering comments and recommendations provided in this report will need to be updated. Alternatively, a geotechnical memorandum can be issued providing updated geotechnical comments and recommendations based on the findings from the test pits.

New footings founded at different elevations should be located such that the higher new footings are set below a line drawn up at 10 horizontal to 7 vertical (10H:7V) from the near edge of the lower new footing, as shown below. 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

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 where the snow will be removed from the vicinity of the structure. When earth cover is less than the required cover, an equivalent thermal combination of earth cover and rigid insulation or rigid insulation alone should be provided.

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.

9. Floor Slab and Drainage Requirements

It is assumed that the ground floor of the proposed addition will match the ground floor of the existing community centre that is located near existing grade. The floor slab for the community centre addition may be designed and constructed as a slab-on-grade placed on a 200 mm thick 19 mm sized clear stone bed placed on a minimum 300 mm thick engineered fill pad constructed in accordance with Section 7 of this geotechnical report. The clear stone would minimize the capillary rise of moisture from the sub-soil to the floor slab. As an alternative to the clear stone layer, the floor slab may be cast on a 200 mm thick bed of OPSS Granular A overlain by a vapour barrier. Adequate saw cuts should be provided in the floor slabs to control cracking.

It is recommended that a perimeter drainage system be installed around the proposed addition to the community centre. If a perimeter drainage system is encountered along the existing community centre building during the construction of the addition, it should be reinstated. An underfloor drainage system is not required for the proposed community centre addition.

The slab-on-grade floor should be set at a minimum of 150 mm higher than the surrounding final exterior grade of the proposed community centre addition.

The final exterior grade surrounding the proposed community centre addition should be sloped away from the proposed addition to prevent ponding of surface water close to the exterior walls of the community centre addition.

10. Excavation and De-Watering Requirements

10.1 Excess Soil Management

Ontario Regulation 406/19 specifies protocols that are 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 and the requirements of the receiving site. 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.

Reference is made to the Phase Two ESA report prepared by EXP regarding the environmental condition of the soils.

10.2 Excavation

Excavations for the proposed community centre addition and for the installation of underground services are anticipated to extend to an approximate maximum 3.0 m depth below existing grade. The excavations will extend through the pavement structure, topsoil, fill and into the silty clay and glacial till. Based on the groundwater level measurements, the excavations may be above or below the groundwater level.

Excavations may be undertaken using conventional heavy equipment.

Open cut excavation within the subsurface soils should comply with the most recent Occupational Health and Safety Act (OHSA), Ontario Regulations 213/91 (August 1, 1991). Based on the definitions contained in OHSA, the subsurface soils at the site are classified as Type 3 soil and as such the excavation sidewalls must be cut back at 1H:1V from the bottom of the excavation. Below the groundwater table, the excavation side slopes are expected to slough and will eventually stabilize at a slope of 2H:1V to 3H:1V from the bottom of the excavation. For properly dewatered excavations, the installation of municipal underground services may be undertaken within the confines of a prefabricated support system (trench box) designed and installed in accordance with OHSA.

Excavations that extend to the glacial till or terminate in the glacial till that is below the groundwater level may be susceptible to instability of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction to be undertaken under relatively dry conditions, it will be necessary to lower the groundwater table to below the final excavation depth prior to start of excavation. This may be achieved by installing deep sumps and pumping with high-capacity pumps on a continuous basis. The groundwater level should be lowered and maintained to 1.0 m below the bottom of the excavation until construction below grade has been completed. The contractor should determine the most appropriate dewatering method for the given site conditions and for the construction to be undertaken in relatively dry conditions.

Excavations that extend into and terminate within the stiff to hard silty clay are not expected to experience base-heave type failure.

If the required gradient of the side slopes of the walls of the excavation cannot be satisfied due to the proximity of the excavation to existing buildings, infrastructure or roadways, the excavation would need to be undertaken within the confines of a 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 OHSA and the 2023 Fifth Edition CFEM (Canadian Foundation Engineering Manual).

The shoring system as well as adjacent settlement sensitive structures and infrastructure should be monitored for movement (deflection) on a periodic basis during construction operations.

A pre-construction condition survey of the existing community centre building, other buildings and infrastructure located within the construction zone of influence should be undertaken prior to the start of any construction activities.

It is recommended that vibration monitoring of the existing community centre building, surrounding existing buildings as well as any other adjacent structures and infrastructure located within the construction zone of influence should be undertaken during construction activities.

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 above the groundwater level into the excavations is anticipated and it may be possible to remove the water by conventional sump pumping technique. Excavations that extend to the glacial till or into the glacial till that is below the groundwater level may be susceptible to instability of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction to be undertaken under relatively dry conditions, it will be necessary to lower the groundwater table to below the final excavation depth prior to start of excavation. This may be achieved by installing deep sumps and pumping with high-capacity pumps on a continuous basis. The groundwater level should be lowered and maintained to 1.0 m below the bottom of the excavation until construction below grade has been completed. The contractor should determine the most appropriate dewatering method for the given site conditions and for the construction to be undertaken in relatively dry conditions.

For future construction related dewatering where the daily pumping volumes exceed 50,000 L/day, the project can be registered on the Environmental Activity and Sector Registry maintained by the Ontario Ministry of the Environment, Conservation and Parks (MECP). The registration requires dedicated Water Taking and Discharge reports to be registered in the EASR and the reports are to be prepared by a qualified Professional Engineer of Ontario or qualified Professional Geoscientist of Ontario that address all potential adverse impacts that the dewatering operations may have on the natural environment (i.e. settlement of adjacent structures, water quality of pumped water and applicable discharge location). There are no limits to the volume of water that can be included in an EASR registration, however durations of pumping of longer than 365 consecutive days will require approval from the Municipality and relevant Conservation Authorities. Specific permits related to the discharge water may be required (i.e. Sewer Use Agreements, etc.) either at the Municipal or Provincial levels depending on the volume and quality of the water to be discharged from the site.

Although this geotechnical 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. Pipe Bedding Requirements

The depth at which municipal services will be installed is anticipated to be a maximum of 3.0 m depth below existing grade. Based on this, the subgrade for the underground service pipes is expected to be within the silty clay and glacial till.

The bedding for the underground services including material specifications, thickness of cover material and compaction requirements conform to municipal requirements and/or Ontario Provincial Standard Specification and Drawings (OPSS and OPSD).

It is recommended that the pipe bedding be 300 mm thick and consist of OPSS Granular A. The bedding material should be placed along the sides and on top of the pipe to provide a minimum cover of 300 mm. The bedding should be compacted to at least 98 percent of the SPMDD.

The bedding thickness may be further increased in areas where the subgrade becomes disturbed. Trench base stabilization techniques, such as the removal of loose/soft material, placement of additional sub-bedding, consisting of Ontario Provincial Standard Specification (OPSS) Granular B Type II completely wrapped in a non-woven geotextile, may be used if trench base disturbance becomes a problem in wet or soft/loose areas.

To minimize settlement of the pavement structure over services trenches, the trench backfill material within the frost zone, to 1.8 m depth below final grade, should match the existing material along the trench walls to minimize differential frost heaving of the subgrade soil, provided this material is compactible. Otherwise, frost tapers may be required.

The municipal services should be installed in short open trench sections that are excavated and backfilled the same day.

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

The on-site soils to be excavated are topsoil, fill, silty clay and glacial till. From a geotechnical perspective and subject to additional examination and testing during construction, portions of the fill (free of organics, organic stains, debris, cobbles and boulders), silty clay and glacial till (free of cobbles and boulders) above the groundwater level may be re-used as fill material to raise the grades at the site to the design subgrade level in landscaped, parking lot and access road areas. These soils are susceptible to moisture absorption due to precipitation and therefore should be protected from the elements if stockpiled on site. The soils below the groundwater table are expected to be too wet for re-use and for adequate compaction and should be discarded. However, these soils below the groundwater table may be used for general grading purposes in the landscape areas if left in the sun to dry or mixed with drier material. The topsoil is not considered suitable for use as backfill material.

It is anticipated that the majority of the material required for backfilling purposes in the interior and exterior of the proposed community centre addition, for service trench backfill and for use as subgrade fill would have to be imported and should preferably conform to the following specifications:

- Engineered fill and service trench backfill under the floor slab within the proposed addition to the community centre building - OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent SPMDD,
- Backfill material against foundation walls, located outside/exterior side of the proposed building addition – OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD,
- Service trench backfill and subgrade fill for parking lot and access roads should consist of OPSS Granular B Type II or OPSS 1010 Select Subgrade Material (SSM) placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD; and
- Fill for landscaped areas should be clean fill free of debris, topsoil (organic soil), cobbles and boulders placed in 300 mm thick lifts and each lift compacted to 92 percent SPMDD.

13. Pavement Structures

Based on a review of the borehole information, the subgrade for proposed new access road and parking lot areas is anticipated to consist of silty clay, OPSS Granular B Type II material or select subgrade material (SSM). The pavement structure thicknesses required for the proposed access road and new parking lot were computed and are shown on Table VI.

The pavement structure thicknesses are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples and pavement functional design life of ten (10) to fifteen (15) years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table VI: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Light Duty Traffic (Cars)	Heavy Duty Traffic (Buses and Trucks)
Asphaltic Concrete (PG 58-34)	92 percent to 97 percent MRD	65 mm HL3/SP12.5 Category B	50 mm HL3/SP12.5 Category B 60 mm HL8 SP19.0 Category B
OPSS Granular A Base	100 percent SPMDD	150 mm	150 mm
OPSS Granular B Type II Sub-Base	100 percent SPMDD	450 mm	600 mm

Notes:
1. *SPMDD denotes standard Proctor maximum dry density.*
2. *MRD denotes maximum relative density.*
3. *The upper 300 mm of the subgrade must be compacted to 98 percent SPMDD.*
4. *The approved subgrade should be covered with a woven geotextile prior to placement of granular sub-base of the pavement structure.*

The foregoing design assumes that construction is carried out during dry periods and that the subgrade is stable under the load of construction equipment. If construction is carried out during wet weather, and heaving or rolling of the subgrade is experienced, additional thickness of granular material and/or geotextile may be required.

Additional comments on the construction of proposed new parking lot and access road areas are as follows:

- As part of the subgrade preparation for the areas to be paved, the proposed new pavement areas should be stripped of topsoil, organic stained soil and other obviously unsuitable material. The subgrade should be properly shaped, crowned, then proof-rolled with a non-vibratory roller in the full-time presence of a representative of this office. Any soft or spongy subgrade areas detected should be sub excavated and properly replaced with suitable OPSS Granular B Type II compacted to 95 percent SPMDD.
- The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. The need for adequate drainage cannot be over-emphasized. Subdrains must be installed in the proposed parking area and on both sides of the access road at low points and should be continuous between catch basins to intercept excess surface and subsurface moisture and to prevent subgrade softening. This will ensure no water collects in the granular course, which could result in pavement failure during the spring thaw. The location and extent of sub drainage required within the paved areas should be reviewed by this office in conjunction with the proposed site grading.

- To minimize the problems of differential movement between the pavement and catchbasins/ manhole due to frost action, the backfill around the structures should consist of free-draining granular preferably conforming to OPSS Granular B Type II material.
- The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum cross fall of 2 percent) to provide effective surface drainage towards catchbasins. Surface water should not be allowed to pond adjacent to the outside edges of paved areas.
- Relatively weaker subgrade may develop over service trenches at subgrade level. These areas may require the use of thicker/coarser sub-base material and the use of a geotextile at the subgrade level. if this is the case, it is recommended that additional 150 mm of granular sub-base OPSS Granular B Type II should be provided in these areas in addition to the use of a geotextile at the subgrade level.
- The granular materials used for pavement construction should conform to OPSS 1010 for Granular A and Granular B Type II and should be compacted to 100 percent of the SPMDD (ASTM D698). The asphaltic concrete and its placement should meet OPSS requirements. It should be compacted to a minimum of 92 percent of the maximum relative density in accordance with ASTM D2041.

It is recommended that EXP be retained to review the final pavement structure design and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

14. Subsurface Concrete and Steel Requirements

Chemical tests on one (1) soil sample limited to pH, sulphate, chloride and resistivity were submitted for analysis. A summary of the results is shown in Table VII. The laboratory certificate of analysis report is shown in Appendix B.

Table VII: Corrosion Test Results on Grey Silty Clay

Borehole No. (BH): Sample No. (SS)	Depth (m)	Soil Type	pH	Sulphate (%)	Chloride (%)	Resistivity (ohm-cm)
BH25-03: SS3	2.3-2.9	Grey Silty Clay	8.24	0.0023	0.0091	3850

Based on a review of the lab test results, the concentration of sulphate in the silty clay would have a negligible potential of sulphate attack on subsurface concrete. The concrete should be designed in accordance with CSA A23.1:24/CSA A23.2:24.

The resistivity test result indicates that the silty clay is is mildly corrosive to bare steel as per the National Association of Corrosion Engineers (NACE). Appropriate measures should be taken to protect the bare buried steel from corrosion.

15. Tree Planting Restrictions

The site is underlain by sensitive marine clay. The results of the Atterberg limits and grain size analysis of the silty clay of the marine deposit were compared with the document titled, *Tree Planting in Sensitive Marine Clay Soils – 2017 City of Ottawa Guidelines (2017 Guidelines)* and indicate the silty clay has a high potential for soil volume change. For soils that have a high potential for soil volume change, the 2017 guidelines indicate that the tree to foundation setback distance and tree planting restrictions should be in accordance with the 2005 City of Ottawa Clay Soils Policy.

A landscape architect should be consulted to ensure the setbacks and tree planting restrictions are in accordance with the 2005 City of Ottawa Clay Soils Policy.

16. Additional Test Pits

Test pits should be undertaken along the north wall of the existing building to confirm the depth of the existing footings. Based on the findings from the test pits, the geotechnical engineering comments and recommendations provided in this report will need to be updated. Alternatively, a geotechnical memorandum can be issued providing updated geotechnical comments and recommendations based on the findings from the test pits.

17. 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 the 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, additional testing may be required. Reference is made to the EXP Phase One and Two ESA reports regarding the environmental aspects of the soils and groundwater.

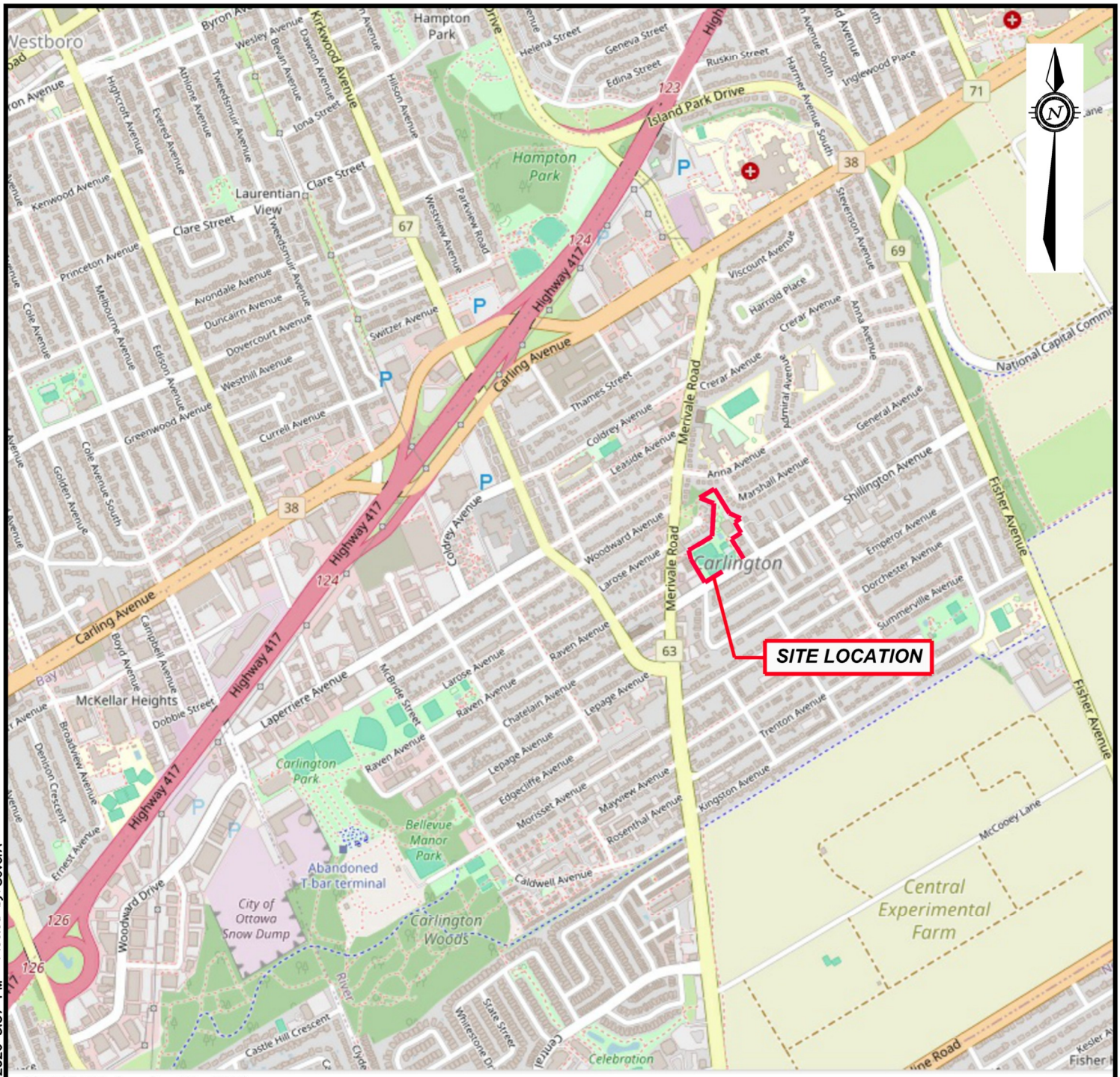
We trust that the information contained in this geotechnical report will be satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Sincerely,

Susan M. Potyondy, P.Eng.
Senior Geotechnical Engineer
Earth & Environment

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

Figures



SOURCE MAP: *Open Street Map* (2025)

LEGEND

PROPERTY BOUNDARY

ORIGINAL SHEET SIZE = 8.5" X 11"

0 150m 300m 600m

HORIZONTAL 1:15,000

EXP Services Inc. **www.exp.com**

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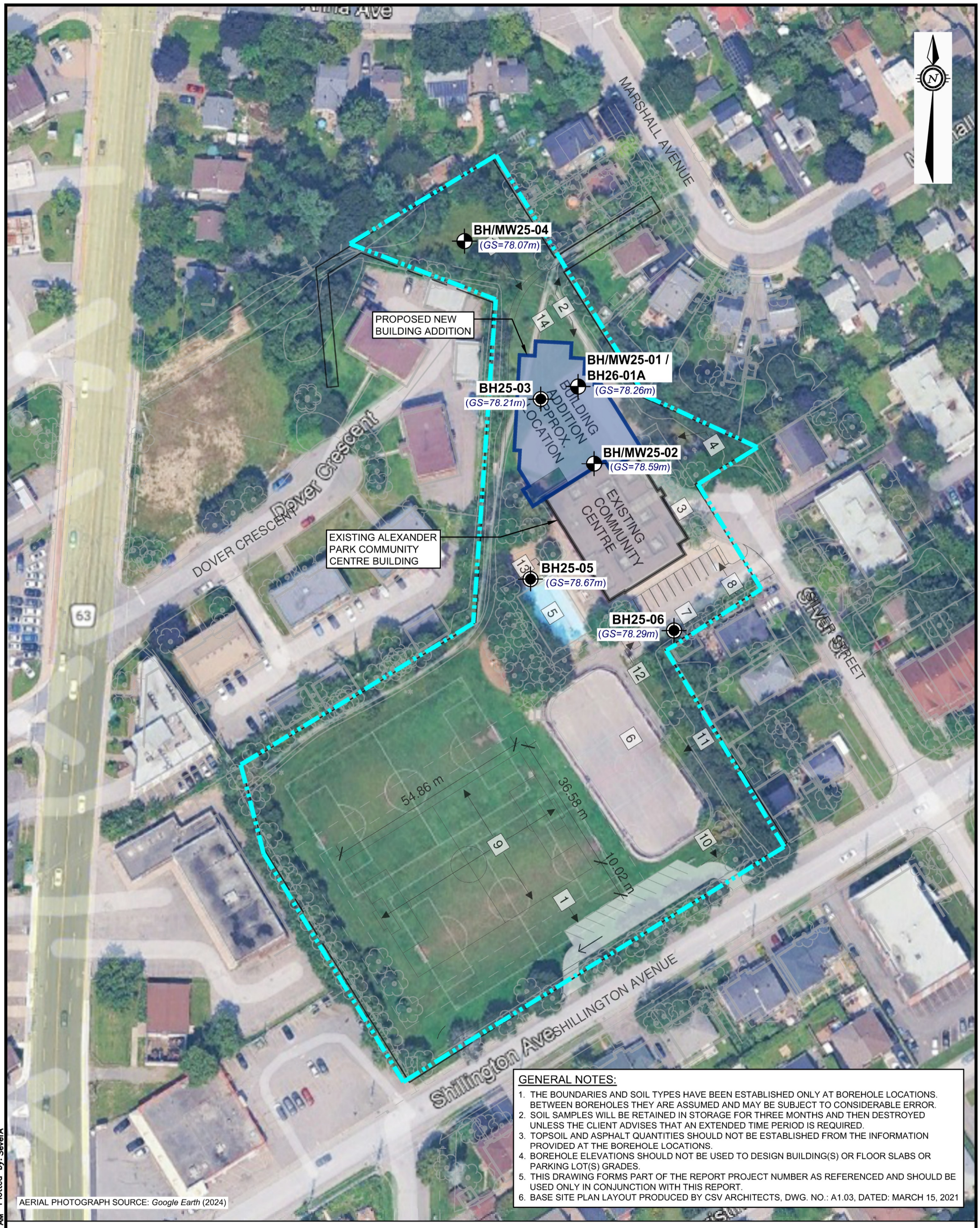
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

DATE: FEBRUARY 2026	CLIENT: CITY OF OTTAWA		project no.: OTT-23011957-Q0
DESIGN: SP / CHECKED: IT	PROPERTY ADDRESS: ALEXANDER COMMUNITY CENTRE, 960 SILVER STREET, OTTAWA, ON		scale: 1:15,000
DRAWN BY: AS	PROJECT: GEOTECHNICAL INVESTIGATION, PROPOSED ADDITION	TITLE: SITE LOCATION PLAN	FIG 1

Filename: E:\OTT\OTT-23011957-Q0\60 Execution\65 Drawings\OTT-23011957-Q0_Geo_Alexander-Park_960-Silver-St.dwg
Last Saved: Feb 5, 2026 2:35 PM Last Plotted: Feb 5, 2026 3:37 PM Plotted by: SeverA



GENERAL 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 AND ASPHALT 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.
6. BASE SITE PLAN LAYOUT PRODUCED BY CSV ARCHITECTS, DWG. NO.: A1.03, DATED: MARCH 15, 2021

LEGEND

- PROPERTY BOUNDARY
- **BH/MW25-02** — BOREHOLE / MONITORING WELL NO. & LOCATION (*EXP*, 2025)
- **BH26-01A** — BOREHOLE NO. & LOCATION (*EXP*, 2026)
- **BH25-03** — BOREHOLE NO. & LOCATION (*EXP*, 2025)
- *(GS=78.26m)* — GROUND SURFACE ELEVATION (m)

ORIGINAL SHEET SIZE = 11" X 17"

0 10m 20m 40m

HORIZONTAL 1:1000

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2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

DATE: FEBRUARY 2026	CLIENT: CITY OF OTTAWA		project no. OTT-23011957-Q0
DESIGN: SP / CHECKED: IT	PROPERTY ADDRESS: ALEXANDER COMMUNITY CENTRE, 960 SILVER STREET, OTTAWA, ON		scale 1:1,000
DRAWN BY: AS	PROJECT: GEOTECHNICAL INVESTIGATION, PROPOSED ADDITION		
	TITLE: BOREHOLE LOCATION PLAN		FIG 2

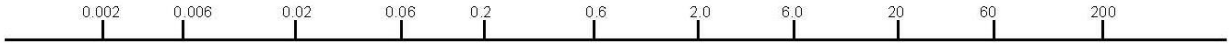
Filename: E:\OTT\OTT-23011957-Q0\60 Execution\65 Drawings\OTT-23011957-Q0_Geo_Alexander-Park_960-Silver-St.dwg
Last Saved: Feb 9, 2026 11:39 AM Last Plotted: Feb 9, 2026 11:41 AM Plotted by: SeverA

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		



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/MW25-01

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 'November 11, 2025

Drill Type: Geo probe

Datum: Geodetic Elevation

Logged by: JE Checked by: SMP

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	Geodetic Elevation m	Depth
		ASPHALT ~25 mm thick	78.26	0
		FILL~675 mm thick Silty sand, trace gravel, clay pockets, brown, moist, no odours, no stains (loose)	78.2	
		SILTY CLAY Trace sand, brown, moist, no odours, no stains (very stiff to hard)	77.6	1
			75.6	2
		GLACIAL TILL Silty sand, some gravel, trace clay, grey, wet, no odours, no stains (very loose)	74.96	3
				4
				5
				6
			70.8	7
		Borehole Terminated at 7.5 m Depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Standard Penetration Test N Value	Shear Strength kPa	Combustible Vapour Reading (ppm)	Natural Moisture Content % / Atterberg Limits (% Dry Weight)
SS1		6		15	×
SS2		5		> 25	20
SS3		4		0	×
			155 kPa, s = 4.0		
SS4		4		0	×
SS5		2		0	×
SS6		1		0	×
SS7		1		0	×
SS8		2		0	×
SS9		1		0	×

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm monitoring well was installed upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'November 13, 2025	3.0	
'November 26, 2025	3.3	

CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - ALEXANDER PARK.GPJ TROW OTTAWA.GDT 2/9/26

Log of Borehole BH26-01A

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 4

Page. 1 of 2

Date Drilled: 'January 23, 2026

Drill Type: CME-75 Truck-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: JE Checked by: IT

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	Geodetic Elevation 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
		ASPHALT ~25 mm thick	78.26	0				
		FILL~1375 mm thick Silty sand, trace gravel, with clay pockets, brown, moist to wet, no odours, no stains, (compact)	78.2				SS1	
				1	20	×	SS2	
		SILTY CLAY Brown, wet, no odours, no stains (stiff to hard)	76.9		> 250 kPa			
				2	2 60 kPa s=12.0	×	SS3	
		GLACIAL TILL Silty sand with gravel, brown, wet, no odours, no stains, (loose)	74.7	3				
				4	8	×	SS4	
				5	7	×	SS5	
				6	4		SS6	
					5	×	SS7	
				7				
				8	8	×	SS8	
				9				
		COBBLY AND BOULDERY GLACIAL TILL With gravel, brown to grey, wet, no odours, no stains	69.2	10			RUN 1	

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. The borehole was backfilled upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	9.1 - 10.7		
2	10.7 - 12.2		
3	12.2 - 13.7		

LOG OF BOREHOLE LOGS OF BOREHOLES - BH25-01A.GPJ TROW OTTAWA.GDT 2/9/26

Log of Borehole BH26-01A

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Figure No. 4

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		COBBLY AND BOULDERY GLACIAL TILL	68.26	10				
		With gravel, brown to grey, wet, no odours, no stains *(continued)*		11				RUN 2
				12				
				13				RUN 3
			64.6					
		Borehole Terminated at 13.7 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. The borehole was backfilled upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	9.1 - 10.7		
2	10.7 - 12.2		
3	12.2 - 13.7		

LOG OF BOREHOLE LOGS OF BOREHOLES - BH25-01A.GPJ TROW OTTAWA.GDT 2/9/26

Log of Borehole BH/MW25-02

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 5

Page. 1 of 1

Date Drilled: 'November 10, 2025

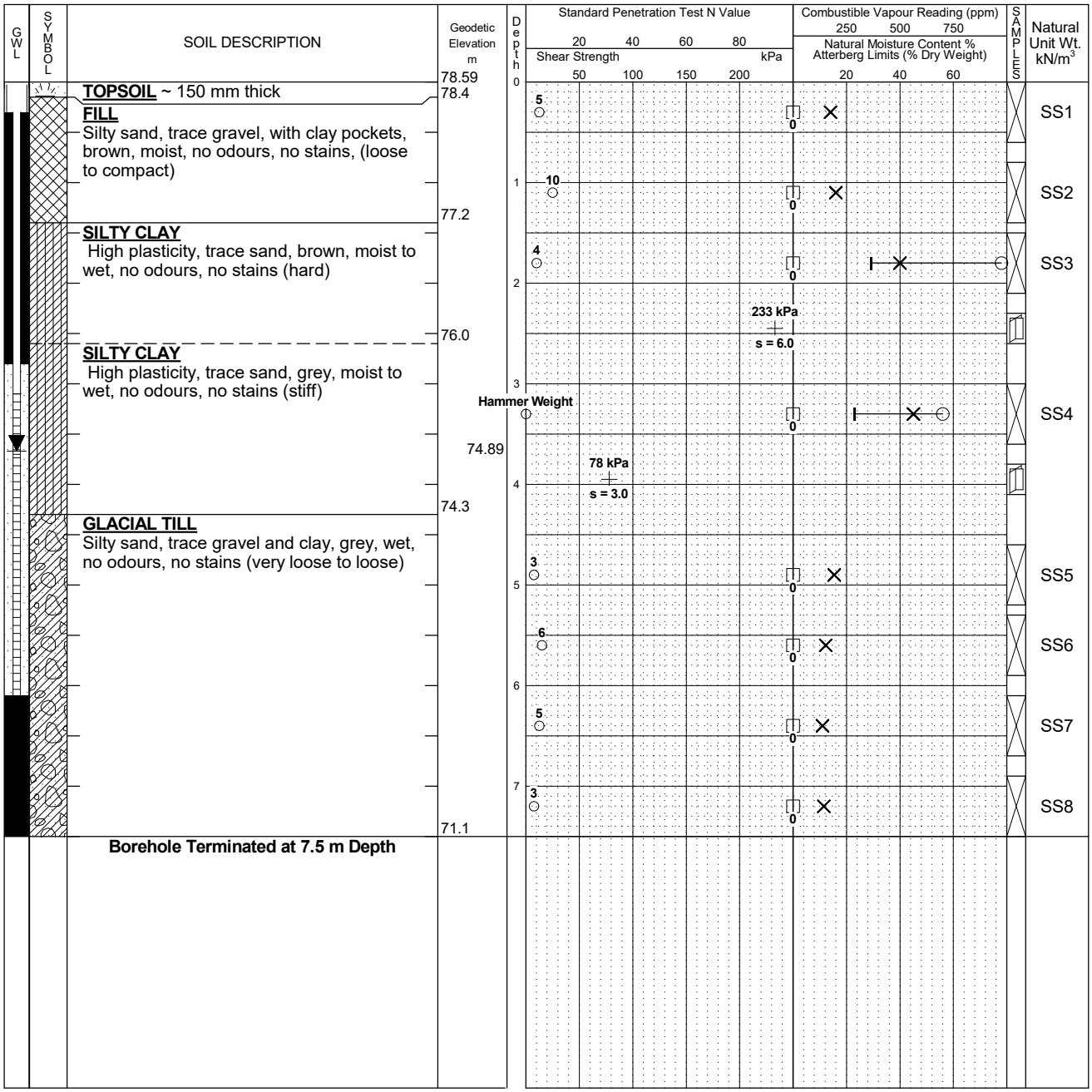
Drill Type: Geo probe

Datum: Geodetic Elevation

Logged by: JE Checked by: SMP

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 ▲



LOG OF BOREHOLE LOGS OF BOREHOLES - ALEXANDER PARK.GPJ TROW OTTAWA.GDT 2/9/26

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm monitoring well was installed upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'November 13, 2025	3.6	
'November 26, 2025	3.7	

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

Log of Borehole BH25-03

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 6

Page. 1 of 1

Date Drilled: 'November 11, 2025

Drill Type: Geo probe

Datum: Geodetic Elevation

Logged by: JE Checked by: SMP

Split Spoon Sample ☒ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ■ | Shear Strength by Vane Test +S

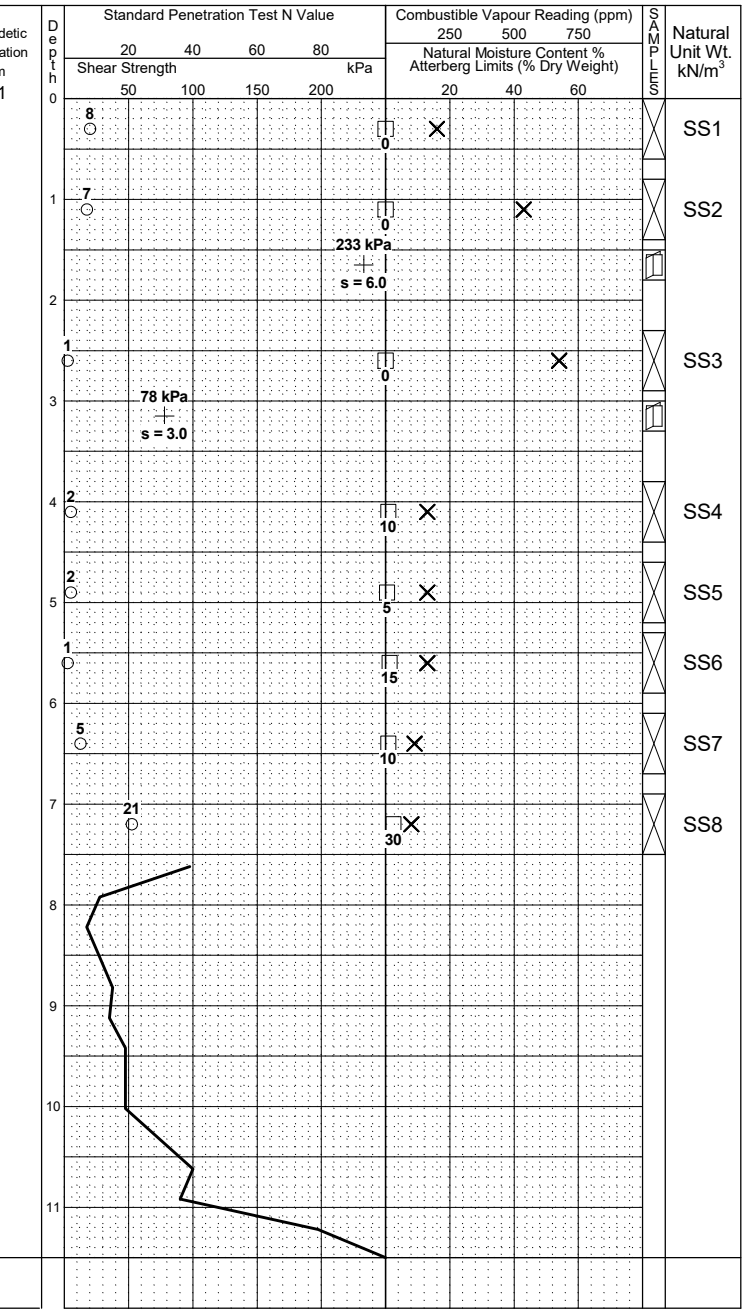
Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
			78.21	0
		TOPSOIL ~180 mm thick	78.0	
		FILL Silty sand, brown, damp, no odours, no stains, (loose)	77.2	1
		SILTY CLAY Trace sand, brown, damp to wet, no odours, no stains (hard)	76.1	2
		SILTY CLAY Trace sand, grey, damp to wet, no odours, no stains (stiff)	74.6	3
		GLACIAL TILL Silty sand with gravel, grey, wet, no odours, no stains, (very loose to compact)	70.7	4
		Dynamic Cone Penetration Test (DCPT) conducted from 7.5 m depth to cone refusal at 11.5 m depth	66.7	7
		Cone Refusal at 11.5 m Depth		11

Standard Penetration Test N Value (20 40 60 80) | Shear Strength (50 100 150 200 kPa)

Combustible Vapour Reading (ppm) (250 500 750) | Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)

SAMPLES	Natural Unit Wt. kN/m³
SS1	
SS2	
SS3	
SS4	
SS5	
SS6	
SS7	
SS8	



NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole was backfilled upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'November 11, 2025	dry	7.6

CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - ALEXANDER PARK.GPJ TROW OTTAWA.GDT 2/9/26

Log of Borehole BH/MW25-04

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 7

Page. 1 of 1

Date Drilled: 'November 11, 2025

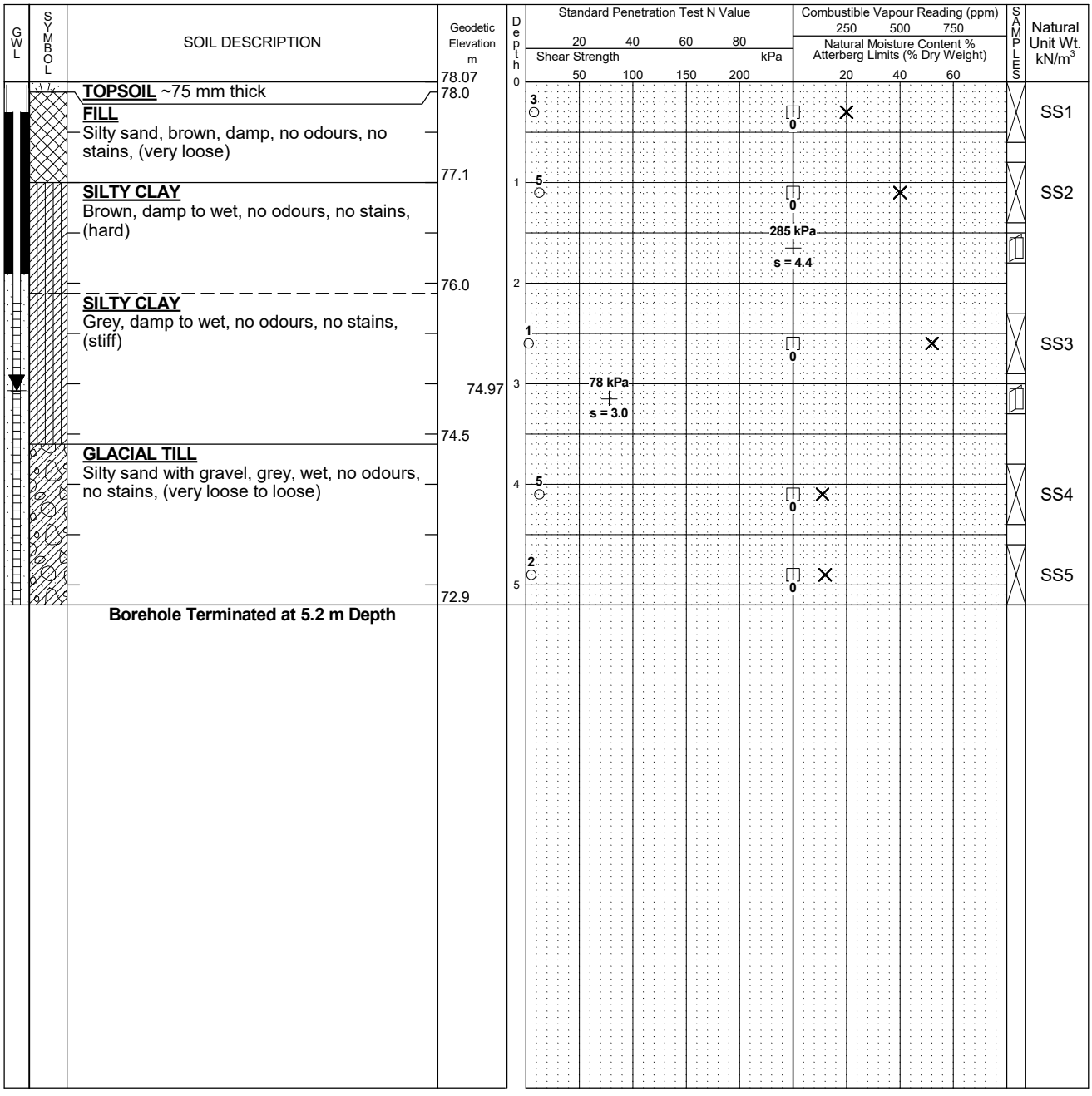
Drill Type: Geo probe

Datum: Geodetic Elevation

Logged by: JE Checked by: SMP

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 ▲



NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50mm monitoring well was installed upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'November 13, 2025	3.7	
'November 26, 2025	3.1	

CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - ALEXANDER PARK.GPJ TROW OTTAWA.GDT 2/9/26

Log of Borehole BH25-05

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 8

Page. 1 of 1

Date Drilled: 'November 10, 2025

Drill Type: Geo probe

Datum: Geodetic Elevation

Logged by: JE Checked by: SMP

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	Geodetic Elevation 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
		ASPHALT ~75 mm thick	78.67	0				
		GRANULAR FILL ~ 760 mm thick Silty sand and gravel, brown, damp, no odours, no stains, (loose)	78.6		8	0	SS1	
		FILL Silty sand, brown, damp, no odours, no stains, (compact)	77.9	1	13	0	SS2	
		SILTY CLAY Brown, damp to wet, no odours, no stains, (very stiff)	77.3	2	5 103 kPa s = 2.0 3	0 0	SS3 SS4	
		SILTY CLAY Grey, damp to wet, no odours, no stains, (stiff to very stiff)	75.7	3	103 kPa s = 4.0 Hammer Weight	0	SS5	
					91 kPa s = 3.5			
		Borehole Terminated at 4.9 m Depth	73.8					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole was backfilled upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'November 10, 2025	dry	4.3

CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - ALEXANDER PARK.GPJ TROW OTTAWA.GDT 2/9/26

Log of Borehole BH25-06

Project No: OTT-23011957-Q0

Project: Proposed Addition To Alexander Community Center Building

Location: 960 Silver Street, Ottawa, Ontario

Figure No. 9

Page. 1 of 1

Date Drilled: 'November 10, 2025

Drill Type: Geo probe

Datum: Geodetic Elevation

Logged by: JE Checked by: SMP

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	Geodetic Elevation m	Depth
		ASPHALT ~50 mm thick	78.29	0
		GRANULAR FILL ~ 200 mm thick	78.2	
		Silty sand and gravel, with asphalt fragments, brown, damp, no odours, no stains	78.0	
		FILL Silty sand with gravel, clay pockets, brown, moist, no odours, no stains, (compact)	77.5	1
		SILTY CLAY Brown, damp to moist, no odours, no stains, (hard)	76.5	
		Borehole Terminated at 1.8 m Depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Standard Penetration Test N Value	Combustible Vapour Reading (ppm)	Natural Moisture Content % Atterberg Limits (% Dry Weight)
SS1		11	0	×
SS2		8	0	×
SS3		8	>250 kPa	×

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole was backfilled upon completion.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23011957-Q0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'November 10, 2025	dry	1.5

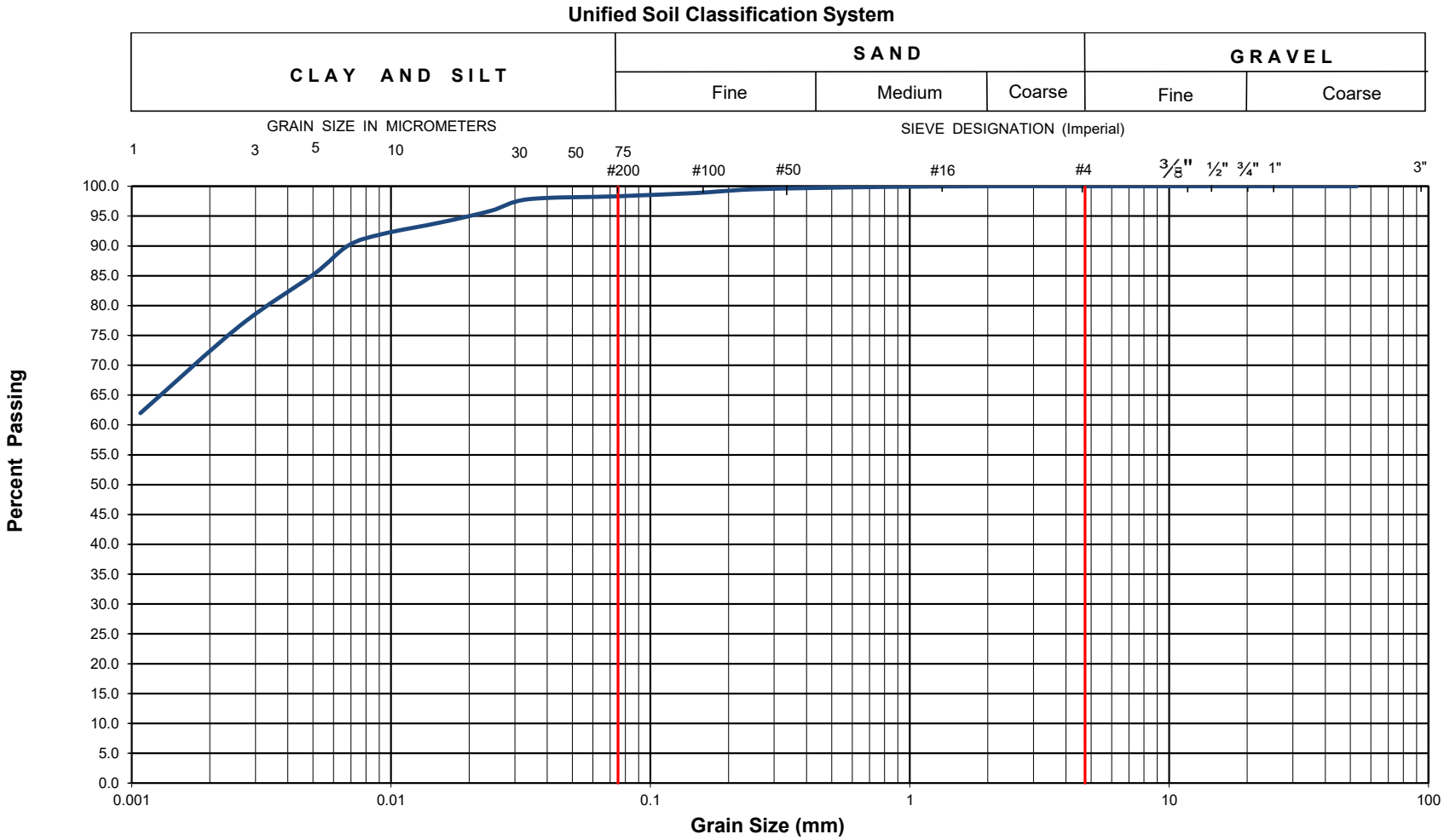
CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - ALEXANDER PARK.GPJ TROW OTTAWA.GDT 2/9/26

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

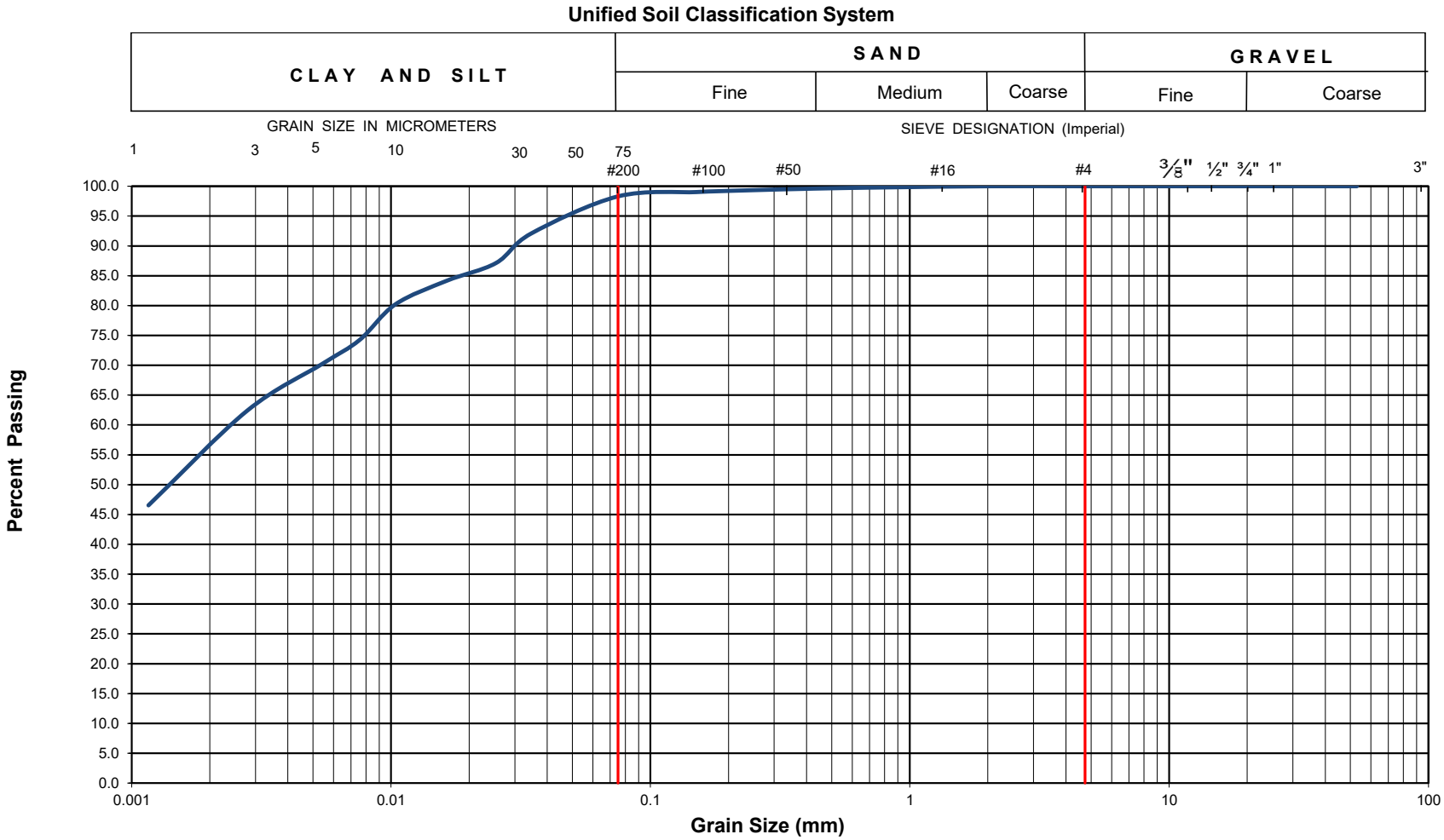
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-23011957-Q0**	**Project Name :**	**Proposed Addition to Alexander Community Center Building**						
Client :	**City of Ottawa**	**Project Location :**	**960 Silver Street, Ottawa, Ontario**						
Date Sampled :	**November 10, 2025**	**Borehole No:**	**25-02**		**Sample No.:**	**SS3**		**Depth (m) :**	**1.5-2.1**
Sample Description :		**% Silt and Clay**	**98**	**% Sand**	**2**	**% Gravel**	**0**	**Figure :**	**10**
Sample Description :	**SILTY CLAY OF HIGH PLASTICITY (CH): Trace Sand**								

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

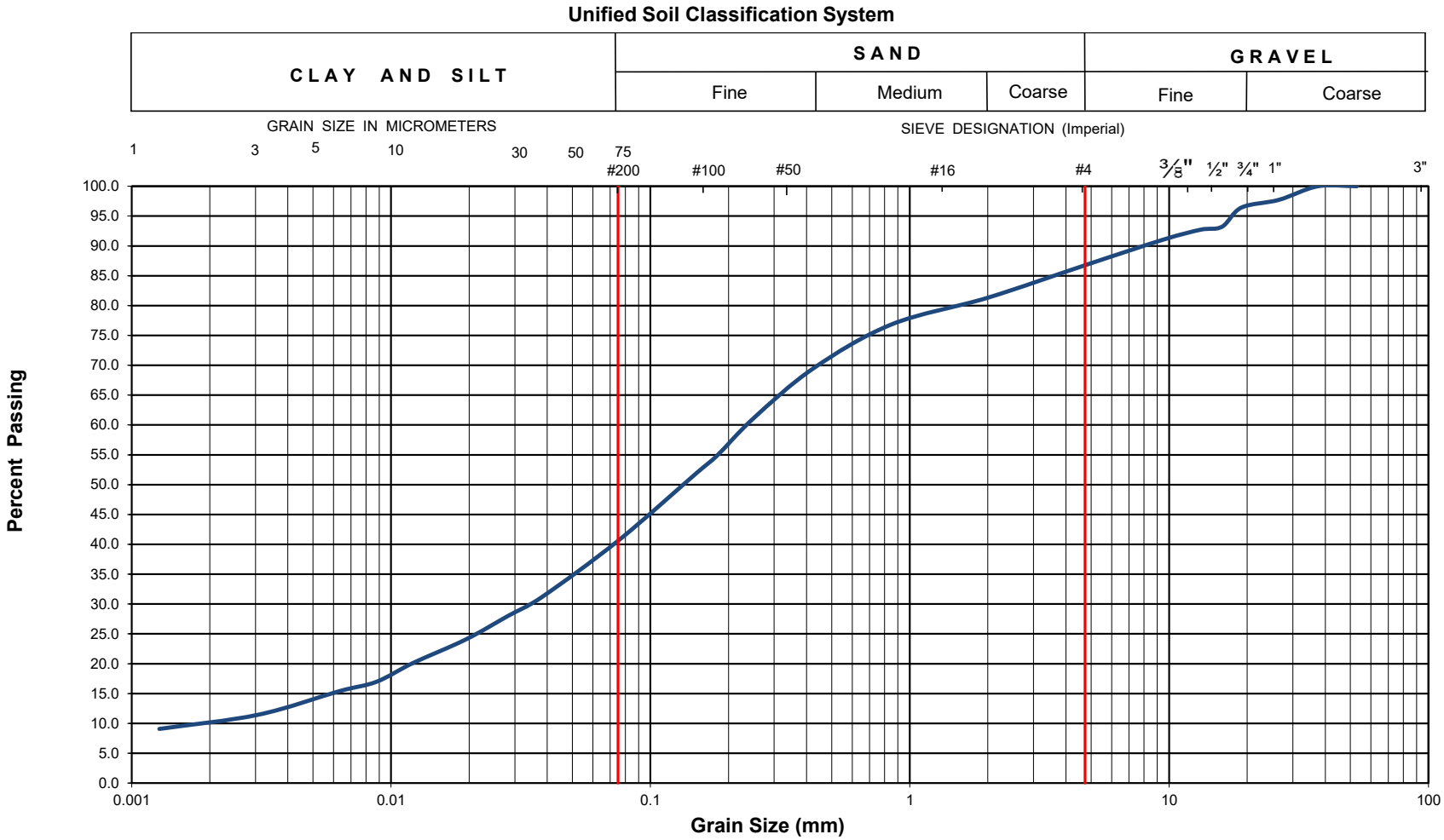
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-23011957-Q0**	**Project Name :**	**Proposed Addition to Alexander Community Center Building**						
Client :	**City of Ottawa**	**Project Location :**	**960 Silver Street, Ottawa, Ontario**						
Date Sampled :	**November 10, 2025**	**Borehole No:**	**25-02**	**Sample No.:**	**SS4**	**Depth (m) :**	**3.0-3.6**		
Sample Description :		**% Silt and Clay**	**98**	**% Sand**	**2**	**% Gravel**	**0**	**Figure :**	**11**
Sample Description :	**SILTY CLAY OF HIGH PALSTICITY (CH): Trace Sand**								

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

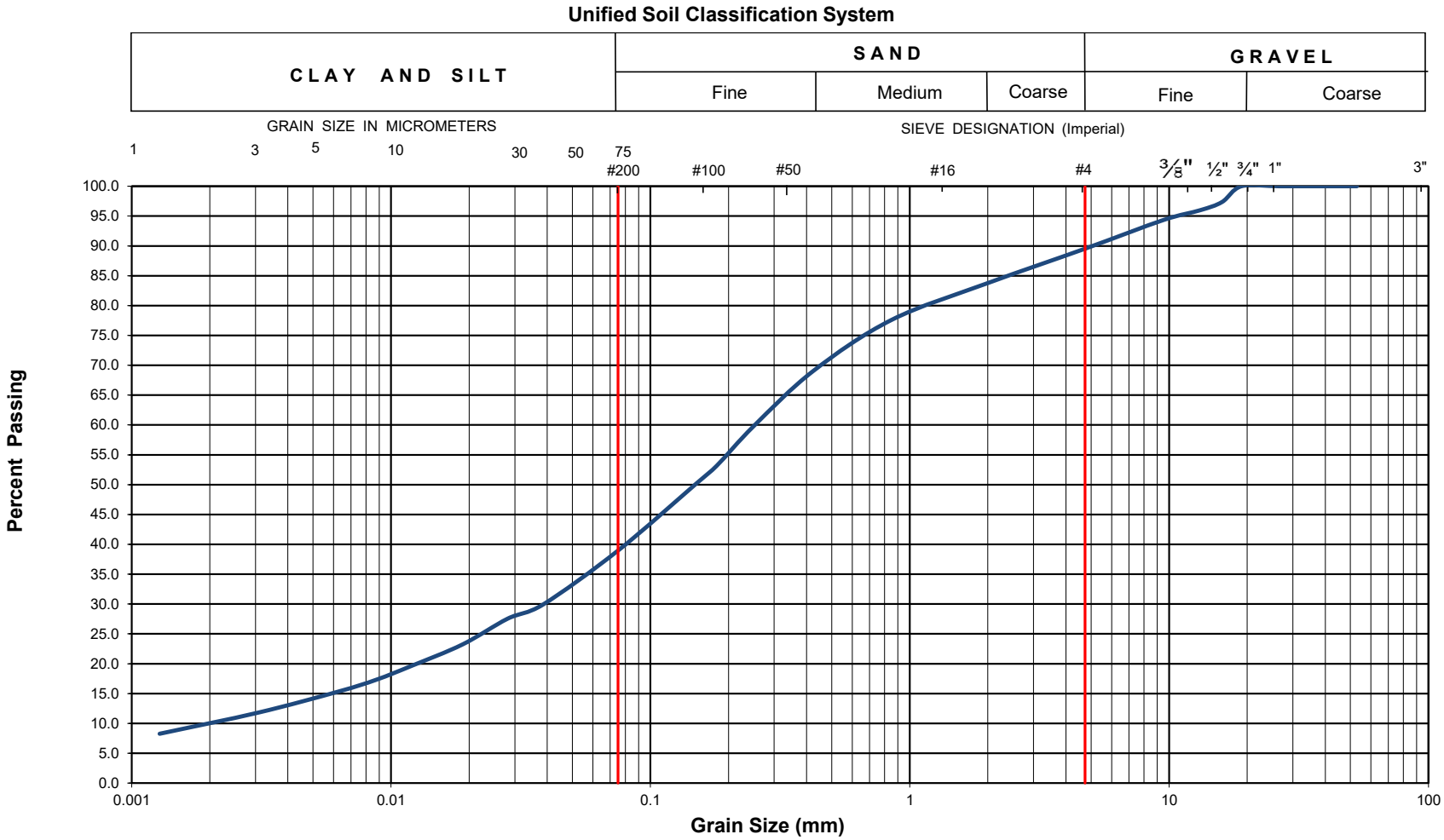
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-23011957-Q0**	**Project Name :**	**Proposed Addition to Alexander Community Center Building**						
Client :	**City of Ottawa**	**Project Location :**	**960 Silver Street, Ottawa, Ontario**						
Date Sampled :	**November 11, 2025**	**Borehole No:**	**25-01**		**Sample No.:**	**SS6**		**Depth (m) :**	**4.6-5.2**
Sample Description :		**% Silt and Clay**	**41**	**% Sand**	**46**	**% Gravel**	**13**	**Figure :**	**12**
Sample Description :	**GLACIAL TILL: Silty Sand (SM) - Some Gravel, Trace Clay**								

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

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



EXP Project No.:	**OTT-23011957-Q0**	**Project Name :**	**Proposed Addition to Alexander Community Center Building**						
Client :	**City of Ottawa**	**Project Location :**	**960 Silver Street, Ottawa, Ontario**						
Date Sampled :	**November 10, 2025**	**Borehole No:**	**25-02**	**Sample No.:**	**SS8**	**Depth (m) :**	**6.9-7.5**		
Sample Description :		**% Silt and Clay**	**39**	**% Sand**	**51**	**% Gravel**	**10**	**Figure :**	**13**
Sample Description :	**GLACIAL TILL: Silty Sand (SM) - Trace Gravel and Clay**								

Appendix A – Shear Wave Velocity Sounding Survey Report by GPR

GEOPHYSICS GPR INTERNATIONAL INC.

February 23rd, 2026

Transmitted by email : ismail.taki@exp.com
Our ref. : GPR26-06841

Mr. Ismail Taki, M.Eng., P.Eng.
Senior Manager, Earth & Environment, Eastern Region
exp Services inc.
Suite 100 - 2650 Queensview Drive
Ottawa ON K2B 8H6

Subject: **Shear Wave Velocity Sounding for the Site Designation Determination**
Alexander Park, 960 Silver Street, Ottawa (ON)

[Project #: OTT-23011957-Q0]

Dear Mr. Taki,

Geophysics GPR International inc. has been mandated by **exp** Services inc. to carry out a seismic survey at Alexander Park, 960 Silver Street, in Ottawa (ON). The geophysical investigations used the Multi-channel Analysis of Surface Waves (MASW) with the Spatial AutoCorrelation (SPAC), and the seismic refraction method. From the subsequent results, the seismic shear wave velocity values were calculated for the soils and the rock, to determine the Site Designation.

The surveys were conducted January 27th, 2026, by Mr. Anthony Carelli, GIT and Mr. Javier Andres Hurtado Montealegre. Figure 1 shows the regional location of the site and Figure 2 illustrates the location of the seismic spreads. Both figures are presented in the Appendix.

The following paragraphs briefly describe the principles of the testing method, the survey design, and the results presented in table and graph.

MASW Principle

The *Multi-channel Analysis of Surface Waves* (MASW) and the *SPatial AutoCorrelation* (SPAC or MAM for *Microtremors Array Method*) are seismic methods used to evaluate the shear wave velocities of subsurface materials through the analysis of the dispersion properties of the Rayleigh surface wave. The MASW is considered an "active" method, as the seismic signal is induced at known location and time in the geophones' spread axis. Conversely, the SPAC is considered a "passive" method, using the low frequency "signals" produced far away. The method can also be used with "active" seismic source records. The SPAC method generally allows deeper V_S soundings. Its dispersion curve can then be merged with the one of higher frequency from the MASW to calculate a more complete inversion. The dispersion properties are expressed as a change of velocities with respect to frequencies. Surface wave energy will decay exponentially with depth. Lower frequency surface waves will travel deeper and thus be more influenced by deeper velocity layering than the shallow higher frequency waves. The inversion of the Rayleigh wave dispersion curve yields a shear wave (V_S) velocity depth profile (sounding).

Figure 3 schematically outlines the basic operating procedure for the MASW method. Figure 4 illustrates an example of one of the MASW/SPAC records, a corresponding spectrogram analysis and resulting 1D V_S model.

INTERPRETATION

The main processing sequence involved data inspection and edition when required; spectral analysis (from MASW and SPAC); picking the fundamental mode; and 1D inversion of the MASW and SPAC shot records using the SeisImagerSW™ software. The data inversions used a nonlinear least squares algorithm.

In theory, all the shot records for a given seismic spread should produce a similar shear-wave velocity profile. In practice, however, differences can arise due to energy dissipation, local surface seismic velocities variations, and/or dipping of overburden layers or rock. In general, the precision of the calculated seismic shear wave velocities (V_S) is around 15% or better.

More detailed descriptions of these methods are presented in *Shear Wave Velocity Measurement Guidelines for Canadian Seismic Site Characterization in Soil and Rock*, Hunter, J.A., Crow, H.L., et al., Geological Surveys of Canada, General Information Product 110, 2015.

SURVEY DESIGN

The seismic acquisition layouts were located along a park trail, covered with snow and ice (Figure 2). The geophone spacing was 3.0 metres for the main seismic line, using 24 geophones. A shorter seismic spread with geophones spacing of 1.0 metre was dedicated to the near surface materials. The seismic records were produced with a GEODE seismograph (from Geometrics), and the geophones were 4.5 Hz.

The seismic records counted 4096 data, sampled at 1000 µs for the MASW surveys, and at 31 µs for the seismic refraction ones. The records included a pre-trigged portion of 10 ms. A 9 kg sledgehammer was used as the energy source, with impacts being recorded off both ends of the seismic spreads. A stacking procedure was also used to improve the Signal / Noise ratio for the seismic records. The shear wave depth sounding can be considered as the average of the bulk area within the geophone spread, especially for its central half-length.

RESULTS

The MASW calculated V_S results are illustrated at Figure 5.

The $\overline{V}_{S30}$ value results from the harmonic average of the shear wave velocities, from the surface to 30 metres deep. It is calculated by dividing the total depth of interest (30 metres) by the sum of the time spent in each velocity layer from the surface down to 30 metres, as:

$$\bar{V}_{S30} = \frac{\sum_{i=1}^{N} H_i}{\sum_{i=1}^{N} {H_i}/{V_i}} \quad | \quad \sum_{i=1}^{N} H_i = 30 \text{ m}$$

(N: number of layers; H_i : thickness of layer "*i*" ; V_i : V_S of layer "*i*")

Thus, the $\overline{V}_{S30}$ value represents the seismic shear wave velocity of an equivalent homogeneous single layer response, between the surface and 30 metres deep.

The calculation of the $\overline{V}_{S30}$ value is presented at Table 1. The Site Designation is X_{650}, corresponding to Site Class "C".

CONCLUSION

Geophysical surveys were carried out to identify the Site Designation at Alexander Park, located at 960 Silver Street, Carlington, in Ottawa (ON). The seismic surveys used the MASW and SPAC analysis to calculate the $\overline{V}_{S30}$ value. Its calculation is presented at Table 1.

For the actual site, the Site Designation is X_{650}, corresponding to the Site Class "C" ($360 < \overline{V}_{S30} \leq 760$ m/s), as determined through the MASW and SPAC methods, Table 4.1.8.4.-B of the NBC (2020), and the Building Code, O. Reg. 163/24.

It must be noted that other geotechnical information gleaned on site; including the presence of liquefiable soils, very soft clays, high moisture content etc. (cf. Tables 4.1.8.4.-A and 4.1.8.4.-B of the NBC 2020) can supersede the Site Classification and the Site Designation provided in this report, based on the $\overline{V}_{S30}$ value.

The V_S values calculated are representative of the in situ materials and are not corrected for the total and effective stresses.

Hoping the whole to your satisfaction, we remain yours truly,

P.Eng.

Jean-Luc Arsenault, M.A.Sc., P.Eng.
Senior Project Manager

LICENSED PROFESSIONAL ENGINEER
2026-02-23
J.-L. ARSENAULT
100148122
PROVINCE OF ONTARIO

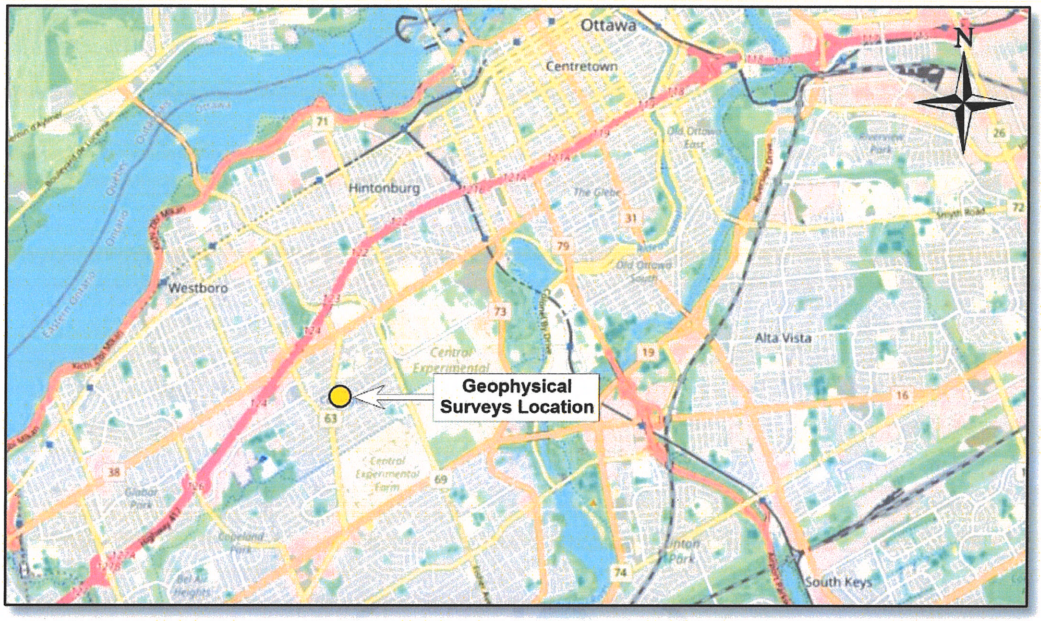


Figure 1: Regional location of the Site
(Source : OpenStreetMap©)

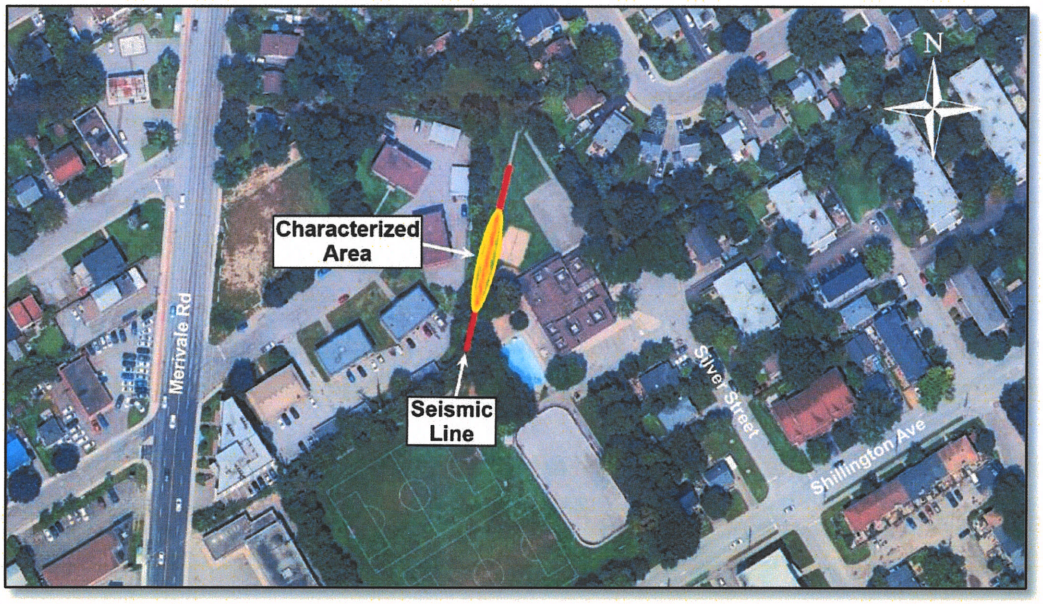


Figure 2: Location of the seismic spreads
(source: *Google Earth™*)

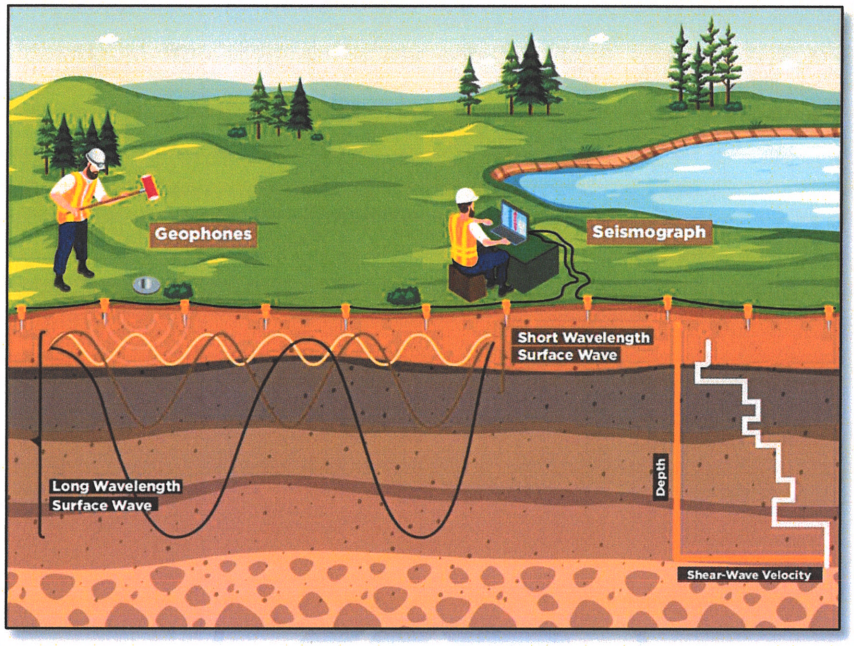


Figure 3: MASW Operating Principle

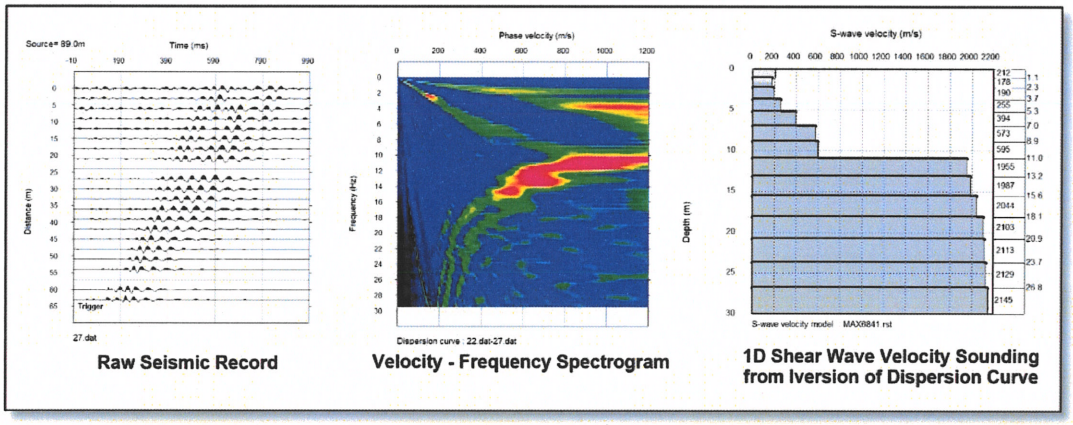


Figure 4: Example of a MASW/SPAC record, Phase Velocity - Frequency curve of the Rayleigh wave and resulting 1D Shear Wave Velocity Model

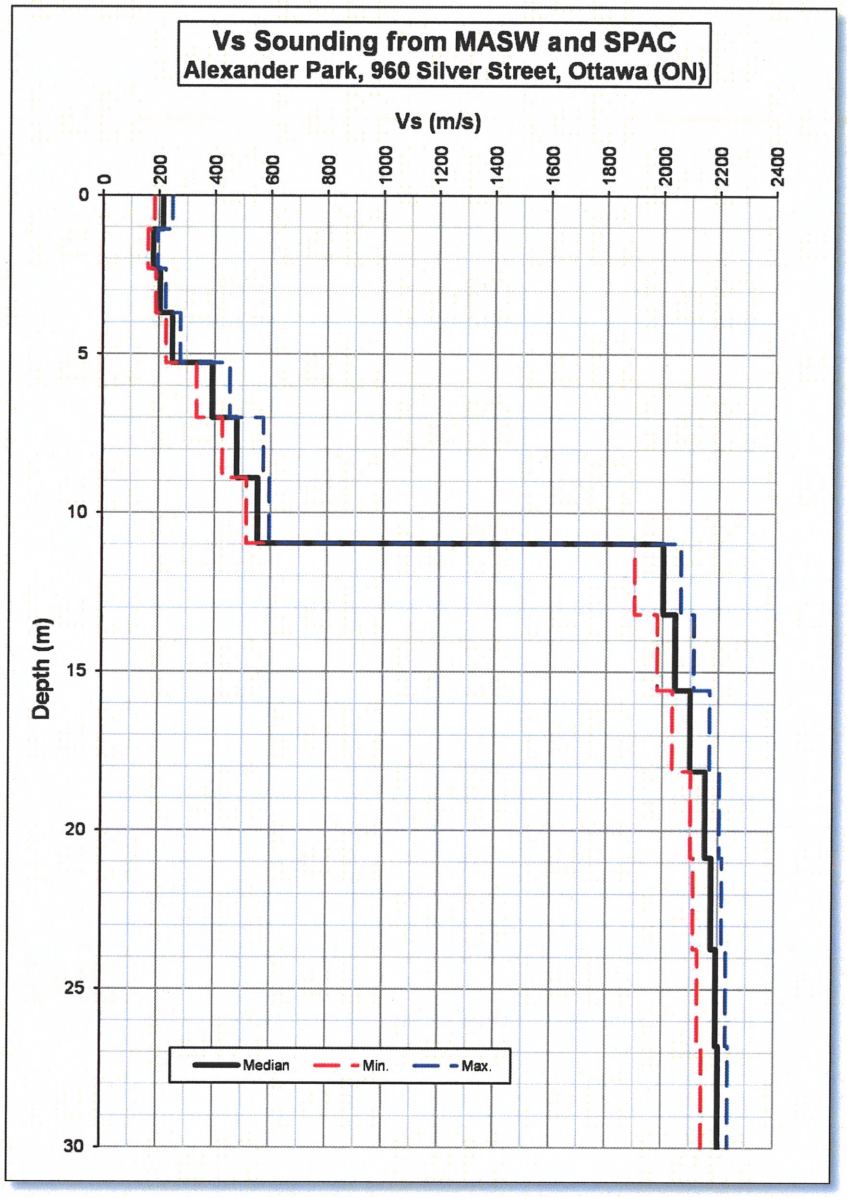


Figure 5: MASW Shear-Wave Velocity Sounding

TABLE 1

$\bar{V}_{S30}$ Calculation for the Site Designation (actual site)

Depth	Vs			Thickness	Cumulative Thickness	Delay for med. Vs	Cumulative Delay	Vs at given Depth
	Min.	Median	Max.					
(m)	(m/s)	(m/s)	(m/s)	(m)	(m)	(s)	(s)	(m/s)
0	183.3	213.7	247.1	**Grade Level (January 27th, 2026)**				
1.07	161.1	178.4	194.6	1.07	1.07	0.005014	0.005014	213.7
2.31	189.1	203.6	223.7	1.24	2.31	0.006930	0.011944	193.2
3.71	225.3	247.7	276.5	1.40	3.71	0.006883	0.018827	197.0
5.27	335.9	390.9	454.5	1.57	5.27	0.006322	0.025149	209.7
7.01	427.5	479.6	573.2	1.73	7.01	0.004428	0.029577	236.9
8.90	513.6	553.3	595.2	1.90	8.90	0.003953	0.033529	265.5
10.96	1901.2	2001.8	2065.7	2.06	10.96	0.003724	0.037254	294.2
13.19	1982.8	2045.3	2112.8	2.23	13.19	0.001112	0.038365	343.7
15.58	2037.0	2099.4	2170.7	2.39	15.58	0.001169	0.039534	394.0
18.13	2103.6	2154.3	2205.6	2.55	18.13	0.001217	0.040751	444.9
20.85	2113.5	2176.3	2214.7	2.72	20.85	0.001262	0.042013	496.3
23.74	2129.9	2193.4	2230.5	2.88	23.74	0.001325	0.043339	547.7
26.79	2145.9	2203.3	2239.4	3.05	26.79	0.001390	0.044729	598.8
30				3.21	30.00	0.001459	0.046188	649.5

V_{S30} (m/s)	**649.5**
Class	**C**

Appendix B – Laboratory Certificate of Analysis Report by AGAT

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-23011957-Q0
AGAT WORK ORDER: 25Z381827
SOIL ANALYSIS REVIEWED BY: Sukhwinder Randhawa, Inorganic Team Lead
DATE REPORTED: Dec 12, 2025
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.*
- *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 is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.*
- *This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 25Z381827

PROJECT: OTT-23011957-Q0

CLIENT NAME: EXP SERVICES INC

ATTENTION TO: Matthew Zammit

SAMPLING SITE:960 Silver Street (Alexander Park), Ottawa

SAMPLED BY:EXP

Inorganic Chemistry (Soil)

DATE RECEIVED: 2025-12-05 **DATE REPORTED: 2025-12-12**

				BH25-03 SS3
		SAMPLE DESCRIPTION:		7.5-9.5'
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2025-11-11
Parameter	Unit	G / S	RDL	7319528
Chloride (2:1)	µg/g		2	91
Sulphate (2:1)	µg/g		2	23
pH (2:1)	pH Units		NA	8.24
Resistivity (2:1) (Calculated)	ohm.cm		1	3850

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

7319528 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:

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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 25Z381827

PROJECT: OTT-23011957-Q0

ATTENTION TO: Matthew Zammit

SAMPLING SITE:960 Silver Street (Alexander Park), Ottawa

SAMPLED BY:EXP

Soil Analysis

RPT Date: Dec 12, 2025			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)	7326723		51	49	4.0%	< 2	100%	70%	130%	103%	80%	120%	109%	70%	130%
Sulphate (2:1)	7326723		27	26	3.8%	< 2	93%	70%	130%	102%	80%	120%	105%	70%	130%
pH (2:1)	7319528	7319528	8.24	7.87	4.6%	NA	97%	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

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CANADA L4Z 1Y2
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Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 25Z381827

PROJECT: OTT-23011957-Q0

ATTENTION TO: Matthew Zammit

SAMPLING SITE:960 Silver Street (Alexander Park), 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
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
webearth.agatlabs.com

Have feedback? Scan here for a quick survey!

Chain of Custody Record

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

Laboratory Use Only
Work Order #: 2573818 27
Cooler Quantity: n/a - no ice/packs
Arrival Temperatures: 19.1 19.5 19.5
Depot Temperatures: 20.3 20.5 20.7
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Report Information:
Company: EXP Services Inc
Contact: Matthew Zammit
Address: 2650 Queensview Drive, Suite 100
Ottawa, Ontario, K2B 8H6
Phone: 613-688-1899 Fax:
Reports to be sent to:
1. Email: matthew.zammit@exp.com
2. Email: ryan.digiuseppe@exp.com

Regulatory Requirements:
(Please check all applicable boxes)

☐ Regulation 153/04 — Table (Indicate One): ☐ Ind/Com ☐ Res/Park ☐ Agriculture; Soil Texture (Check One): ☐ Coarse ☐ Fine
☐ Regulation 406 — Table (Indicate One): ☐ Ind/Com ☐ Res/Park ☐ Agriculture
☐ 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 (RSC)**? ☐ Yes ☐ No

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

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 CSR

Project Information:
Project: OTT-23011957-Q0
Site Location: 960 Silver Street (Alexander Park), Ottawa
Sampled By: EXP
AGAT Quote #: 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:

Legal Sample ☐

Sample Matrix Legend
GW	Ground Water	SD	Sediment
O	Oil	SW	Surface Water
P	Paint	R	Rock/Shale
S	Soil		

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	VOC	PAHs	PCBs: Aroclors ☐	O. Reg 406: Regulation 406 Characterization Package	O. Reg 406: pH, Metals, BTEX, F1-F4	O. Reg 406: EC, SAR	O. Reg 406: Regulation 406 SPLP Rainwater Leach mSPLP: ☐ Metals ☐ VOCs ☐ SVOCs ☐ OC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Corrosivity: ☐ Moisture ☐ Sulphide	pH	Sulphates	Chlorides	Resistivity			Potentially Hazardous or High Concentration (Y/N)
1. BH25-03 SS3 7.5-9.5'	Nov 11	AM/PM	1																☑	☑	☑	☑			
2.		AM/PM																							
3.		AM/PM																							
4.		AM/PM																							
5.		AM/PM																							
6.		AM/PM																							
7.		AM/PM																							
8.		AM/PM																							
9.		AM/PM																							
10.		AM/PM																							
11.		AM/PM																							

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			C. Griffith	12/05/25	14h20
CC to Devin	12/05/25	15h00	Samples Received By (Print Name and Sign): DN	12/6/25	10:45
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page ____ of ____
N°:

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

Legal Notification

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