Geotechnical Investigation Report
Proposed Residential Development
Blocks 1 to 3
Codd's Road
Ottawa, Ontario

Client:
New Commons Housing Trust (NCHT)
c/o New Commons Development
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Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed residential development to be located within the Wateridge development at Blocks 1 to 3, Codd's Road, Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by New Commons Housing Trust (NCHT) c/o New Commons Development.

A soil management/excess soil characterization and hydrogeological assessment are being undertaken by EXP concurrently with this geotechnical investigation and are provided in separate reports.

Proposed Development

It is our understanding that seven (7) buildings ranging from four (4) to six (6) storeys will be constructed on top of a podium-style one-level underground parking garage. Details regarding the lowest floor slab of the underground parking garage and site grade raise were not available at the time of this geotechnical investigation.

Fieldwork Program

The fieldwork for this geotechnical investigation was undertaken on July 7, 19, 23 and 24,2025 and consists of thirty-six (36) test holes comprising of thirty (30) test pits (Test Pit Nos. 25-01 to 25-30) and six (6) boreholes (Borehole Nos. 25-06, 25-08, 25-17, 25-19, 25-26 and 25-28) located on the site. The test pits were advanced to termination and bucket refusal depths of 0.5 m to 4.3 m below existing grade. The boreholes were advanced to termination depths of 6.1 m to 7.2 m below existing grade. Monitoring wells were installed in the boreholes for long-term monitoring of the groundwater levels and to obtain groundwater samples, if required.

A seismic shear wave velocity soundings survey consisting of one (1) survey line was conducted at the site on July 4,2025 by Geophysics GPR International Inc. (GPR). The purpose of the seismic shear wave survey was to determine the seismic shear wave velocity of the site and based on the shear wave velocity provide the site designation for seismic design.

Subsurface Conditions

The boreholes revealed that the subsurface conditions consist of fill underlain by limestone bedrock contacted at 0.5 m to 2.9 m depths (Elevation 89.2 m to Elevation 85.9 m). Based on the August 8,2025 set of groundwater level measurements, the groundwater level ranges from 5.1 m to 5.9 m depths (Elevation 84.5 m to Elevation 82.9 m). It is recommended that a second set of groundwater level measurements be taken for the final geotechnical report for this project.

Geotechnical Engineering Comments and Recommendations

Site Designation for Seismic Design

Based on a review of the test hole information, it is considered feasible to support the proposed buildings by footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces).

A seismic shear wave velocity sounding survey was conducted at the site on July 4, 2025, by Geophysics GPR International Inc. (GPR). The survey was undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The July 16,2025 GPR seismic shear wave velocity sounding survey report is shown in Appendix A of the attached geotechnical report and the location of the survey line is shown in Figure 2 of the GPR report and on the Test Hole Location Plan, Figure 2, of the attached geotechnical report.

The results of the survey indicate that for footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces), the average seismic shear wave velocity (V_{s30}) is 1510 m/s. Based on a comparison of V_{s30} equal to 1510 m/s with Sentence (2) in Section 4.1.8.4 of the 2024 Ontario Building Code (OBC) and provided the footings are founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces), the site designation for seismic design is X_{1510}.

Liquefaction Potential of Soils

Since the construction of the one (1) level underground parking garage would require the excavation and removal of all soils on site down to the bedrock, the determination as to whether or not the soils are liquefiable during a seismic event does not need to be considered in the design of the proposed residential development. However, it is noted that based on a review of the test hole information, it is considered that the subsurface soils do not have the potential to liquefy during a seismic event.

Site Grade Raise

The test hole information indicates that compressible clays do not exist at the site. Therefore, from a geotechnical perspective, there is no restriction to raising the grades at the site.

Foundation Considerations

It is our understanding that seven (7) buildings ranging from four (4) to six (6) storeys will be constructed on top of a podium-style one-level underground parking garage. Details regarding the lowest floor slab in the underground parking garage and site grade raise were not available at the time of this geotechnical investigation.

Based on a review of the test hole information, the proposed buildings may be supported by strip and spread footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces). The test hole information indicates the depth to the limestone bedrock ranges from 0.5 m to 2.9 m depths (Elevation 89.2 m to Elevation 85.9 m). The existing topsoil, fill and silty sand to sandy silt are not suitable to support footings and slab-on-grade floor slabs of the proposed buildings.

The proposed buildings may be supported by strip and spread footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones or loose material and designed for a factored geotechnical resistance at ultimate limit state (ULS) of 2000 kPa. The factored ULS value includes a geotechnical resistance factor of 0.5. The serviceability limit state (SLS) bearing pressure of the bedrock, required to produce up to 25 mm total settlement of the structure will be much larger than the recommended value for factored geotechnical resistance at ULS. Therefore, the factored geotechnical resistance at ULS will govern the design.

Total and differential settlements of footings designed to bear on the competent sound limestone bedrock that is free of soil seams, weathered zones or loose material and designed for the recommended factored geotechnical resistance at ULS and properly constructed are expected to be less than 10 mm.

The 2023 Fifth Edition Canadian Foundation Engineering Manual (CFEM) indicates the unfactored coefficient of friction at ULS between the concrete of the underside of the footing and clean sound rock is 0.70. A geotechnical resistance factor of 0.8 should be applied to the unfactored ULS to determine the factored ULS value of 0.56.

Floor Slab and Drainage Requirements

The lowest floor of the parking garage may be designed as a slab-on-grade set on the competent sound bedrock subgrade and may be constructed as a concrete slab-on-grade or as a paved surface. The concrete and asphalt pavement structures indicated in the attached geotechnical report are for light duty traffic (cars) only. EXP can provide concrete and asphalt pavement structures for heavy duty traffic (cars and trucks), if required. The exposed bedrock surface should be examined by a geotechnician and any weathered zones, soil seams or loose material (soil and bedrock pieces) should be excavated and removed from the exposed bedrock subgrade within the floor area.

A permanent perimeter drainage system is required around each of the proposed buildings. The need for underfloor drainage system for each proposed building will have to be assessed once the design elevation of the basement floor is available and compared with the groundwater level.

Excavations and Dewatering Requirements

Excavations for the construction of the footings for the proposed buildings are anticipated to extend to approximate depths of 3.5 m to 4.5 m below existing grade. These excavations will be undertaken through the existing topsoil, pavement structure, fill, silty sand to sandy silt and into the limestone bedrock. The excavations may extend below the groundwater table.

Excavation of the soils may be undertaken using heavy equipment capable of removing cobbles, boulders and debris within the soils.

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils on site are considered to be Type 3 and as such must be cut back at 1H:1V from the bottom of the excavation. Within zones of persistent seepage and below the groundwater level in the soils, the excavation side slopes are expected to slough and eventually stabilize at a slope of 2H:1V to 3H:1V. For properly dewatered excavations, the installation of the municipal underground services may be undertaken within the confines of a prefabricated support system (trench box) designed and installed in accordance with OHSA.

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 excavations are anticipated to extend into the bedrock. Excavations within the weathered zone of the bedrock and for shallow excavations into the competent sound bedrock may be excavated using a hoe ram for the removal of small quantities of the bedrock; however, this process is expected to be very slow. The excavation of the competent sound limestone bedrock to extensive depths below the bedrock surface will likely require line drilling and blasting techniques. Contractors bidding on this project should decide on their own the most preferred rock removal method; hoe ramming or line drilling and blasting.

The excavation side slopes in the weathered limestone bedrock may be cut back at a 1H:1V gradient from the bottom of the weathered bedrock zone. Excavations within the sound bedrock may be undertaken with near vertical sides subject to review by a geotechnical engineer. The rock face of the excavation may require support in the form of shotcreting, wire mesh and/or rock bolts. The need for and type of rock support is best determined during on-site examination of the bedrock during excavation operations.

Excavations above the groundwater may be dewatered by conventional sump pumping techniques. The dewatering of unshored and shored excavations below the groundwater level may also be removed by collecting the water at low points within the unshored and shored excavations and pumping from sumps. In areas of high infiltration, a higher seepage rate should be anticipated and high-capacity pumps may be required to keep the excavation dry.

Pipe Bedding Requirements

The pipe bedding including material specifications, thickness of cover material and compaction requirements should conform to the relevant OPSS or municipality specifications, drawings and special provisions. The bedding and cover material should be compacted to a minimum of 95 percent standard Proctor maximum dry density (SPMDD). It is recommended that the pipe bedding be a minimum 150 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 thickness of 300 mm.

Backfilling Requirements

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

Tree Planting Restrictions

Since sensitive compressible clays were not encountered at the site, there are no restrictions to tree planting from a geotechnical perspective.

Additional Test Pits

In Test Pit No. 25-08, bedrock was not encountered to the test pit termination depth of 4.3 m (Elevation 85.1 m). In Borehole No. 25-08 located approximately 3.0 m east of Test Pit No. 25-08, bedrock as encountered at a 1.7 m depth (Elevation 87.7 m). Since the bedrock depth varies at Test Pit No. 25-08 and at Borehole No. 25-08, it is recommended that additional test pits be conducted in the vicinity of Test Pit No. 25-08 and at Borehole No. 25-08 using a large excavator to better delineate the bedrock

depth (elevation) in the vicinity of these test holes. Based on the findings from the additional test pits, the geotechnical engineering comments and recommendations of this geotechnical report may need to be updated.

It is recommended that a second set of groundwater level measurements be taken for the final geotechnical report for this project.

Closure

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

This executive summary is a brief synopsis of the 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 residential development to be located within the Wateridge development at Blocks 1 to 3, Codd's Road, Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by New Commons Housing Trust (NCHT) c/o New Commons Development.

A soil management/excess soils characterization and hydrogeological assessment are being undertaken by EXP concurrently with this geotechnical investigation and are provided in separate reports.

It is our understanding that seven (7) buildings ranging from four (4) to six (6) storeys will be constructed on top of a podium-style one-level underground parking garage. Details regarding the lowest floor slab of the underground parking garage and site grade raise were not available at the time of this geotechnical investigation.

The geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at thirty-six (36) test holes (30 test pits and 6 boreholes) located on the site,

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

c) Comment on grade-raise restrictions,

d) 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 new residential buildings and comment on the anticipated total and differential settlements of the recommended foundation type,

e) Comment on slab-on-grade construction and the requirement for perimeter and underfloor drainage systems,

f) Provide lateral earth pressure parameters (static and seismic conditions) for the design of the subsurface basement walls,

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

h) Provide pipe bedding requirements,

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

j) Provide pavement structures for parking lots and access roads constructed on the ground and on the concrete podium or roof of the parking garage,

k) Comment on subsurface concrete requirements and corrosion potential of subsurface soils to buried metal structures/members; 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

The site is located within the Wateridge development in Ottawa, Ontario. At the time of this geotechnical investigation, the site was a vacant parcel of land with some soil fill piles and large boulders scattered over the site. In some areas, the site is grass covered with some low brush and small to medium sized trees.

Based on the test hole ground surface elevations ranging from Elevation 90.52 m to Elevation 88.04 m, the site is relatively flat.

3. Procedure

3.1 Test Hole Fieldwork

The fieldwork for this geotechnical investigation was undertaken on July 7, 19, 23 and 24,2025 and consists of thirty-six (36) test holes comprising of thirty (30) test pits (Test Pit Nos. 25-01 to 25-30) and six (6) boreholes (Borehole Nos. 25-06, 25-08, 25-17, 25-19, 25-26 and 25-28) located on the site. The test pits were advanced to termination and bucket refusal depths of 0.5 m to 4.3 m below existing grade. The boreholes were advanced to termination depths of 6.1 m to 7.2 m below existing grade. The test hole fieldwork was supervised on a full-time basis by a representative from EXP.

The locations and geodetic ground surface elevations of the test holes were determined on site by EXP. The locations of the test holes are defined by an approximate 25 m by 25 m grid pattern as shown on the Test Hole Location Plan, Figure 2. It is noted that the six (6) boreholes are located next to the test pit with the same identification number. For example, Borehole No. 25-06 is located next to Test Pit No. 25-06.

Prior to the start of the test hole fieldwork, the test hole locations were cleared of public and private underground services.

The test pits were excavated using a Volvo EC 300 Excavator. The soil conditions exposed in the test pits were logged. In some of the test pits, soil samples (grab samples (GS)) of the different soil types exposed in the test pits were retrieved at selected depth intervals and the soil sample placed in a labelled sample bag. The groundwater level was observed during and upon completion of the excavating of the test pits. Upon completion of the excavation and logging of the test pits, the test pits were backfilled with the excavated soil nominally packed in place using the excavator bucket.

The boreholes were drilled using a CME-55 track-mounted drill rig equipped with soil sampling and bedrock coring capabilities. The boreholes were advanced by power augering technique (no sampling) from the ground surface to auger refusal on the bedrock surface. The presence of the bedrock in the boreholes was confirmed by conventional rock coring techniques using the NQ-sized core barrel. A record of wash-water return, colour of the wash-water and any sudden drops in the core barrel were kept during the coring operation.

The recovered rock cores were placed in core boxes, identified, visually examined and logged on site.

A monitoring well having an outside diameter of 38 mm was installed in each of the six (6) boreholes for long-term monitoring of the groundwater level. The monitoring wells were installed in accordance with EXP standard practice and the installation configuration is documented on the respective borehole log. The boreholes were backfilled upon completion of drilling and the installation of the monitoring wells.

On completion of the test hole fieldwork, the soil samples and rock cores were transported to the EXP laboratory in Ottawa. The samples were reviewed by a geotechnical engineer and test hole logs prepared. The soils are classified by visual examination using the modified Burmister soil classification method.

The rock cores were visually examined by the geotechnical engineer and logged in general accordance with the 2023 Canadian Foundation Engineering Manual (CFEM) Fifth Edition. Photographs were taken of the bedrock cores.

3.2 Laboratory Testing Program

The geotechnical laboratory testing program for the soil samples and rock cores is summarized in Table I.

Table I: Summary of Laboratory Testing Program	
Type of Test	Number of Tests Completed
Soil Samples	
Natural Moisture Content Determination	29
Rock Cores	
Unconfined Compressive Strength and Natural Unit Weight Determination	14
Corrosion Analysis (pH, sulphate, chloride and resistivity)	3

3.3 Seismic Shear Wave Velocity Sounding Survey

A seismic shear wave velocity soundings survey consisting of one (1) survey line was conducted at the site on July 4,2025 by Geophysics GPR International Inc. (GPR). The purpose of the seismic shear wave survey was to determine the seismic shear wave velocity of the site and based on the shear wave velocity provide the site designation for seismic design. The seismic shear wave survey was undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The location of the seismic survey line is shown in the GPR report dated July 16,2025 in Appendix A and on the Test Hole Location Plan, Figure 2 of this geotechnical report.

4. Subsurface Conditions and Groundwater Levels

A detailed description of the subsurface conditions and groundwater levels from the test holes are given on the attached Test Hole Logs, Figure Nos. 3 to 32. The borehole logs for Borehole Nos. 25-06, 25-08, 25-17, 25-19, 25-26 and 25-28 are shown in Figures 8A,10A,19A,21A, 28A and 30A respectively after the test pit log with the same identification number. For example, the log for Borehole No. 25-06 (Figure 8A) can be found after the log for Test Pit No. 25-06 (Figure 8).

The test hole logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and groundwater 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 and test pits excavated 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 soil management/excess soil characterization and hydrogeological assessment reports regarding the environmental aspects of the soil and groundwater.

It should be noted that the soil and bedrock boundaries indicated on the test hole (borehole and test pit) 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 and test pit logs form an integral part of this report and should be read in conjunction with this report.

A review of the test hole (test pit and borehole) logs indicates the following subsurface conditions with depth and groundwater level measurements.

4.1 Topsoil

A surficial 200 mm thick topsoil layer was encountered in Test Pit No. 25-20.

4.2 Pavement Structure

Test Pit No. 25-23 is located in a paved area where the pavement structure consists of 75 mm thick asphaltic concrete underlain by a 125 mm thick granular fill (base) consisting of silty sand and crushed gravel.

4.3 Fill

Fill was contacted in all of the thirty (30) test pits except Test Pit No. 25-20. The fill extends from the existing ground surface and the pavement structure to depths ranging from 0.4 m to 1.9 m (Elevation 89.7 m to 87.0 m). The fill consists of varying percentages of gravel, sand, silt, clay, cobbles, boulders, blast-shattered type rock pieces. Organic zones within the fill are present in Test Pit Nos. 25-25 to 25-27 and contain organic matter in the form of roots, rootlets and parts of trees. In some test pits, the fill contains debris in the form of asphalt, brick, geotextile fabric, plastic bag and plastic pipe. The moisture content of the fill ranges from 6 percent to 36 percent.

4.4 Buried Topsoil Layer

A buried topsoil layer exists below the fill in Test Pit Nos. 25-21, 25-22, 25-28 and 25-30 at 0.7 m to 1.2 m depths (Elevation 88.3 m to Elevation 87.2 m). The buried topsoil layer ranges in thickness form 200 mm to 400 mm. The moisture content of the buried topsoil layer is 20 percent.

4.5 Silty Sand to Sandy Silt

Original soil consisting of silty sand to sandy silt was encountered below the surficial topsoil layer in Test Pit No. 25-20 and beneath the fill and buried topsoil layer in all of the test pits except Test Pit Nos. 25-01, 25-03, 25-08 to 25-10, 25-13, 25-14, 25-16 to 25-19, 25-24 and 25-27. The silty sand to sandy silt was contacted at 0.2 m to 1.9 m depths (Elevation 89.7 m to Elevation

87.0 m). The silty sand to sandy silt contains gravel, cobbles and boulders in some of the test pits. The natural moisture content of the silty sand to sandy silt is 11 percent to 16 percent.

4.6 Limestone Bedrock

Bedrock was contacted on all of the test pits except Test Pit No. 25-08. The bedrock was cored in Borehole Nos. 25-06, 25-08, 25-17, 25-19, 25-26 and 25-28. Photographs of the bedrock cores are shown in Appendix B. Based on a review of the bedrock cores and published bedrock geology maps, the bedrock is limestone bedrock (with shale partings) of the Ottawa formation.

A summary of the bedrock depths (elevations) in the test pits and boreholes is shown in Table II.

Table II: Summary of Bedrock Depths (Elevations)

Test Pit/Borehole No. (TP/BH)	Borehole No. (BH)	Ground Surface Elev. (m)	Bedrock Depth (Elevation) (m)
TP 25-01	-	89.13	0.5 (88.6)
TP 25-02	-	90.33	1.3 (89.0)
TP 25-03	-	90.49	2.9 (87.6)
TP 25-04	-	90.52	1.3 (89.2)
TP 25-05	-	90.46	1.4 (89.1)
TP 25-06	**BH 25-06**	**90.42**	**TP = 1.2 (89.2)**
			BH = 1.7 (88.7)
TP 25-07	-	88.72	1.5 (87.2)
TP 25-08	**BH 25-08**	**89.39**	**TP = *No Bedrock to* 4.3 (85.1)**
			BH = 1.7 (87.7)
TP 25-09	-	89.61	1.3 (88.3)
TP 25-10	-	90.23	1.4 (88.8)
TP 25-11	-	90.01	1.3 (88.7)
TP 25-12	-	89.74	1.3 (88.4)
TP 25-13	-	88.87	0.3 (88.6)
			0.7 (88.2)
TP 25-14	-	89.36	1.1 (88.3)
TP 25-15	-	89.27	1.1 (88.2)
TP 25-16	-	89.26	1.4 (87.9)

Table II: Summary of Bedrock Depths (Elevations)			
Test Pit/Borehole No. (TP/BH)	**Borehole No. (BH)**	**Ground Surface Elev. (m)**	**Bedrock Depth (Elevation) (m)**
TP 25-17	**BH 25-17**	**88.93**	**TP = 1.0 (87.9)**
			BH = 1.2 (87.7)
TP 25-18	-	88.64	0.5 (88.1)
TP 25-19	**BH 25-19**	**88.55**	**TP = 0.8 (87.8)**
			TP = 1.2 (87.4)
			BH = 1.6 (87.0)
TP 25-20	-	88.39	0.6 (87.8)
TP 25-21	-	89.48	2.4 (87.1)
TP 25-22	-	88.72	1.2 (87.5)
TP 25-23	-	88.27	1.5 (86.8)
TP 25-24	-	88.22	0.9 (87.3)
TP 25-25	-	88.94	2.0 (86.9)
TP 25-26	**BH 25-26**	**89.10**	**TP = 2.2 (86.9)**
			BH = 2.3 (86.8)
TP 25-27	-	88.04	1.3 (86.7)
			1.4 (86.6)
TP 25-28	**BH 25-28**	**88.18**	**TP = 1.5 (86.7)**
			BH = 1.4 (86.8)
TP 25-29	-	88.78	2.3 (86.5)
TP 25-30	-	88.52	2.6 (85.9)

Based on a review of Table II, the bedrock depth ranges from 0.5 m to 2.9 m depths (Elevation 89.2 m to Elevation 85.9 m). In Borehole No. 25-08, cobbles, boulders or weathered limestone bedrock exists from 1.3 m to 1.7 m depths (Elevation 88.1 m to Elevation 87.7 m).

Abandoned services trenches were encountered in Test Pit No. 25-19 and 25-27 with the bottom the trenches in the bedrock at a 1.2 m depth (Elevation 87.4 m) in Test Pit No. 25-19 and below a 1.4 m depth (Elevation 86.6 m) in Test Pit No. 25-27.

In some test pits, there is a difference in bedrock depth (elevation) from one side (wall) of the test pit to the other side (wall) of the test pit, suggesting the bedrock surface may be in a 'stepped' pattern at some locations on the site. The test pits with the 'stepped' pattern of the bedrock surface are summarized as follows:

- In Test Pit No. 25-13, bedrock was encountered at a 0.7 m depth (Elevation 88.2 m) on the north side of the test pit and at a 0.3 m depth (Elevation 88.6 m) on the south side of the test pit.
- In Test Pit No. 25-19, bedrock was encountered at a 0.8 m depth (Elevation 87.8 m) on the north side of the test pit and at a 1.2 m depth (Elevation 87.4 m) on the south side of the test pit.
- In Test Pit No. 25-27, bedrock was encountered at a 1.3 m depth (Elevation 86.7 m) on the west side of the test pit and at a 1.4 m depth (Elevation 86.6 m) on the east side of the test pit.

Based on examination of the retrieved bedrock cores, the total core recovery (TCR) ranges from 42 percent to 100 percent and the rock quality designation (RQD) ranges from 20 percent to 95 percent indicating the bedrock has a very poor to excellent quality. The average RQD value is 60 percent indicating an overall bedrock quality of fair.

The unconfined compressive strength and natural unit weight of the limestone bedrock were determined for selected sections of the bedrock cores and the test results are given in Table III.

Table III: Summary of Unconfined Compressive Strength and Unit Weight of Bedrock

Borehole No. (BH): Run No.	Geodetic Elevation of Existing Ground Surface (m)	Depth (Elevation, m)	Unconfined Compressive Strength (MPa)	Natural Unit Weight (kN/m^3)
BH25-06: Run 2	90.42	3.2-3.4 (87.2-87.0)	113.0	26.4
BH25-06: Run 3	90.42	4.7-4.9 (85.7-85.5)	115.0	26.5
BH25-08: Run 3	89.39	3.2-3.3 (86.2-86.1)	188.3	26.9
BH 25-08: Run 4	89.39	5.0-5.3 (84.4-84.1)	159.8	27.0
BH 25-17: Run 2	88.93	2.3-2.5 (86.6-86.4)	63.5	26.7
BH 25-17: Run 3	88.93	3.9-4.1 (85.0-84.8)	101.0	25.8
BH 25-17: Run 4	88.93	5.3-5.4 (83.6-83.5)	93.3	26.1
BH 25-19: Run 2	88.55	3.1-3.6 (85.5-85.0)	147.9	26.0
BH 25-19: Run 3	88.55	4.2-4.3 (84.4-84.3)	244.3	26.8
BH 25-26: Run 2	89.10	4.0-4.2 (85.1-84.9)	125.4	26.1
BH 25-26: Run 3	89.10	4.9-5.0 (84.2-84.1)	126.8	25.6
BH 25-28: Run 1	88.18	2.1-2.3 (86.1-85.9)	131.0	27.2

Table III: Summary of Unconfined Compressive Strength and Unit Weight of Bedrock				
Borehole No. (BH): Run No.	**Geodetic Elevation of Existing Ground Surface (m)**	**Depth (Elevation, m)**	**Unconfined Compressive Strength (MPa)**	**Natural Unit Weight (kN/m^3)**
BH 25-28: Run 2	88.18	3.6-3.8 (84.6-84.4)	130.3	26.9
BH 25-28: Run 3	88.18	4.8-5.0 (83.4-83.2)	175.4	26.8

Based on a review of the unconfined compressive strength of the bedrock, the bedrock is considered to be strong (R4) to very strong (R5) according to the 2023 Fifth Edition Canadian Foundation Engineering Manual.

4.7 Groundwater Level Measurements

A summary of the groundwater level measurements taken in the boreholes equipped with monitoring wells on August 8, 2025 is shown in Table IV.

Table IV: Summary of Groundwater Level Measurements			
Borehole (BH)/ Monitoring Well (MW) No.	**Ground Surface Elevation (m)**	**Date of Measurement (Elapsed Time in Days from Date of Installation)**	**Groundwater Depth Below Ground Surface (Elevation), m**
BH/MW 25-06	90.42	August 8,2025 (16 days)	5.9 (84.5)
BH/MW 25-08	89.39	August 8, 2025 (15 days)	5.8 (83.6)
BH/MW 25-17	88.93	August 8,2025 (15 days)	5.9 (83.0)
BH/MW 25-19	88.55	August 8,2025 (20 days)	5.7 (82.9)
BH/M 25-26	89.10	August 8,2025 (16 days)	5.9 (83.2)
BH/MW 25-28	88.18	August 8,2025 (20 days)	5.1 (83.1)

Based on the August 8,2025 set of groundwater level measurements, the groundwater level ranges from 5.1 m to 5.9 m depths (Elevation 84.5 m to Elevation 82.9 m). It is recommended that a second set of groundwater level measurements be taken for the final geotechnical report for this project.

The groundwater levels were determined in the boreholes at the time and under the conditions stated in the 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 Liquefaction Potential of Soils for Seismic Design

5.1 Site Designation

Based on a review of the test hole information, it is considered feasible to support the proposed buildings by footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces).

A seismic shear wave velocity sounding survey was conducted at the site on July 4, 2025, by Geophysics GPR International Inc. (GPR). The survey was undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The July 16,2025 GPR seismic shear wave velocity sounding survey report is shown in Appendix A and the location of the survey line is shown in Figure 2 of the GPR report and on the Test Hole Location Plan, Figure 2, of this geotechnical report.

The results of the survey indicate that for footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces), the average seismic shear wave velocity (V_{s30}) is 1510 m/s. Based on a comparison of V_{s30} equal to 1510 m/s with Sentence (2) in Section 4.1.8.4 of the 2024 Ontario Building Code (OBC) and provided the footings are founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces), the site designation for seismic design is X_{1510}.

5.2 Liquefaction Potential of Subsurface Soils

Since the construction of the one (1) level underground parking garage would require the excavation and removal of all soils on site down to the bedrock, the determination as to whether or not the soils are liquefiable during a seismic event does not need to be considered in the design of the proposed residential development. However, it is noted that based on a review of the test hole information, it is considered that the subsurface soils do not have the potential to liquefy during a seismic event.

6. Grade Raise Restrictions

The test hole information indicates that compressible clays do not exist at the site. Therefore, from a geotechnical perspective, there is no restriction to raising the grades at the site.

7. Foundation Considerations

It is our understanding that seven (7) buildings ranging from four (4) to six (6) storeys will be constructed on top of a podium-style one-level underground parking garage. Details regarding the lowest floor slab in the underground parking garage and site grade raise were not available at the time of this geotechnical investigation.

Based on a review of the test hole information, the proposed buildings may be supported by strip and spread footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones and loose material (soil and bedrock pieces). The test hole information indicates the depth to the limestone bedrock ranges from 0.5 m to 2.9 m depths (Elevation 89.2 m to Elevation 85.9 m). The existing topsoil, fill and silty sand to sandy silt are not suitable to support footings and slab-on-grade floor slabs of the proposed buildings.

The proposed buildings may be supported by strip and spread footings founded on the competent sound limestone bedrock that is free of soil seams, weathered zones or loose material and designed for a factored geotechnical resistance at ultimate limit state (ULS) of 2000 kPa. The factored ULS value includes a geotechnical resistance factor of 0.5. The serviceability limit state (SLS) bearing pressure of the bedrock, required to produce up to 25 mm total settlement of the structure will be much larger than the recommended value for factored geotechnical resistance at ULS. Therefore, the factored geotechnical resistance at ULS will govern the design.

Total and differential settlements of footings designed to bear on the competent sound limestone bedrock that is free of soil seams, weathered zones or loose material and designed for the recommended factored geotechnical resistance at ULS and properly constructed are expected to be less than 10 mm.

In Test Pit No. 25-08, bedrock was not encountered to the test pit termination depth of 4.3 m (Elevation 85.1 m). In Borehole No. 25-08 located approximately 3.0 m east of Test Pit No. 25-08, bedrock as encountered at a 1.7 m depth (Elevation 87.7 m). Since the bedrock depth varies at Test Pit No. 25-08 and at Borehole No. 25-08, it is recommended that additional test pits be conducted in the vicinity of Test Pit No. 25-08 and Borehole No. 25-08 using a large excavator to better delineate the bedrock depth (elevation) in the vicinity of these test holes. Based on the findings from the additional test pits, the geotechnical engineering comments and recommendations of this geotechnical report may need to be updated.

Footings founded at different elevations in the competent sound bedrock should be located such that the higher footing is located behind a line drawn up at 6V:1H from the bottom of the limit of the footing excavation of the lower footing.

The exposed bedrock subgrade for footings should be examined by a geotechnician to ensure the exposed bedrock subgrade is capable of supporting the recommended factored ULS value and that the footing beds have been properly prepared. Where weathered zones of the bedrock, soil seams and loose material (soil and bedrock pieces) are encountered at the founding surface of the exposed bedrock, these materials will require sub-excavation and removal down to the underlying competent sound bedrock. The footing may be stepped down to the competent sound bedrock in these areas or the sub-excavated area may be backfilled using 20 MPa concrete (or compressive strength specified by the structural engineer) placed on the competent sound bedrock and backfilled to the design underside of footing elevation.

Footings founded on the competent sound limestone bedrock below weathered zones, soft soil/rock seams and loose material do not require frost protection.

The recommended factored geotechnical resistance at ULS has been calculated by EXP from the test hole 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 test holes when foundation construction is underway. The interpretation between test holes 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.

7.1 Sliding Resistance for Footings

The 2023 Fifth Edition Canadian Foundation Engineering Manual (CFEM) indicates the unfactored coefficient of friction at ULS between the concrete of the underside of the footing and clean sound rock is 0.70. A geotechnical resistance factor of 0.8 should be applied to the unfactored ULS to determine the factored ULS value of 0.56.

8. Floor Slab and Drainage Requirements

The lowest floor of the parking garage may be designed as a slab-on-grade set on the competent sound bedrock subgrade and may be constructed as a concrete slab-on-grade or as a paved surface. The concrete and asphalt pavement structures indicated below are for light duty traffic (cars) only. EXP can provide concrete and asphalt pavement structures for heavy duty traffic (cars and trucks), if required. The exposed bedrock surface should be examined by a geotechnician and any weathered zones, soil seams or loose material (soil and bedrock pieces) should be excavated and removed from the exposed bedrock subgrade within the floor area.

A permanent perimeter drainage system is required around each of the proposed buildings. The need for underfloor drainage system for each proposed building will have to be assessed once the design elevation of the basement floor is available and compared with the groundwater level.

The finished exterior grade around the buildings should be sloped away from the buildings to prevent ponding of surface water close to the exterior walls of the buildings.

8.1 Lowest Floor Level as a Concrete Surface

The subgrade is anticipated to consist of limestone bedrock. The limestone bedrock should be examined by EXP and any loose/soft zones of the bedrock should be excavated and removed.

Following approval of the bedrock subgrade, the concrete slab for light duty traffic (cars only) may be constructed as follows:

- 150 mm thick concrete with 32 MPa compressive strength and air content of 5 percent to 8 percent; over
- 150 mm thick layer of Ontario Provincial Standard Specification (OPSS) 1010 Granular A compacted to 100 percent standard Proctor maximum dry density (SPMDD); over
- 300 mm minimum thick layer of OPSS 1010 Granular B Type II compacted to 100 percent SMPDD.

The concrete slab should be reinforced and adequate saw cuts should be provided in the floor slab to control cracking. Once the final design elevation of the lowest floor level is available, the above comments may need to be updated.

8.2 Lowest Floor Level as a Paved Surface

The subgrade is anticipated to consist of limestone bedrock. The limestone bedrock should be examined by EXP and any loose/soft zones of the bedrock should be excavated and removed.

Following approval of the bedrock subgrade, the asphalt pavement structure for light duty traffic (cars only) may be constructed on the bedrock subgrade as follows:

- 65 mm thick layer of asphaltic concrete consisting of HL3/SP12.5 – The asphaltic concrete should be placed and compacted as per OPSS 310 and 313 and should be designed in accordance with OPSS 1150/1151; over
- 150 mm thick layer of OPSS Granular A compacted to 100 percent SPMDD; over
- 450 mm thick layer of OPSS Granular B Type II compacted to 100 percent SPMDD.

9. Lateral Earth Pressure Against Subsurface Walls

The subsurface basement walls of the proposed buildings will be subjected to lateral static earth pressure as well as lateral dynamic earth pressure during a seismic event. The lateral static earth pressure that the subsurface walls would be subjected to may be computed from equations (i) and (ii) and the lateral seismic (dynamic) earth force from equation (iii) given below. It is recommended that the basement walls of the proposed buildings be backfilled with free-draining material such as Ontario Provincial Standard Specification (OPSS) Granular B Type II material compacted to 95 percent standard Proctor maximum dry density (SPMDD) and the basement walls be equipped with a permanent perimeter drainage system.

The equations given below assume that the backfill against the subsurface walls will be free-draining granular material and that a perimeter drainage system will be provided to prevent build-up of hydrostatic pressure behind the wall. Equation (i) will be applicable to the portion of the subsurface wall located within the overburden (soil). Equation (ii) will be applicable to the portion of the subsurface wall located in the bedrock where the earth pressure will be considerably reduced due to the narrow backfill between the subsurface wall and the rock face resulting in an arching effect (Spangler & Handy, 1984).

For design purposes, the lateral static earth pressure against the subsurface wall above the bedrock may be computed from the following equation:

$p = K_o(\gamma h + q)$ ---------- (i)

where p = lateral static earth pressure, kPa
K_0 = lateral earth pressure coefficient for 'at rest' condition = 0.50
γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m^3
h = depth of point of interest below top of backfill, m
q = any surcharge acting at ground surface, kPa

Lateral static earth pressure (σ_n) at depth z from the top of the bedrock surface, due to narrow earth backfill between subsurface wall and rock at depth z, may be computed from the following equation:

$\sigma_n = \frac{\gamma B}{2\tan\delta}\left(1 - e^{-2Ko\frac{z}{B}\tan\delta}\right) + K_o q$ ---------- (ii)

where σ_n = lateral static earth pressure, kPa
γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m^3
B = Backfill width (m)
z = depth from top of bedrock surface (m)
δ = friction angle between the backfill and wall and bedrock (assumed to be equal) = 17 degrees
K_0 = lateral earth pressure coefficient for 'at rest' condition = 0.50
q = surcharge pressure including pressures from overburden soil, traffic load at ground surface and foundations from existing adjacent buildings (kPa)

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

$\Delta_{Pe} = \gamma H^2 \frac{a_h}{g} F_b$ ---------- (iii)

where Δ_{Pe} = dynamic thrust in kN/m of wall
H = height of wall, m
γ = unit weight of backfill material = 22 kN/m^3
$\frac{a_h}{g}$ = seismic coefficient = 0.316g for site designation X_{1510} (2020 National Building Code of Canada Seismic Hazard Tool)
F_b = thrust factor = 1.0

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

For basement walls cast directly against the bedrock, a vertical drainage membrane or board such as Terradrain 200 or equivalent should be installed on the face of the bedrock that leads to a solid discharge pipe connecting to a sump inside the building. The top of the drainage board should be covered with a fabric filter to prevent the loss of the overlying soil into the drainage board.

All subsurface walls should be properly waterproofed.

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 EXP soil management/excess soil characterization or additional comments regarding the environmental aspects of the soils.

10.2 Soil Excavation

Excavations for the construction of the footings for the proposed buildings are anticipated to extend to approximate depths of 3.5 m to 4.5 m below existing grade. These excavations will be undertaken through the existing topsoil, pavement structure, fill, silty sand to sandy silt and into the limestone bedrock. The excavations may extend below the groundwater table.

Excavation of the soils may be undertaken using heavy equipment capable of removing cobbles, boulders and debris within the soils.

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils on site are considered to be Type 3 and as such must be cut back at 1H:1V from the bottom of the excavation. Within zones of persistent seepage and below the groundwater level in the soils, the excavation side slopes are expected to slough and eventually stabilize at a slope of 2H:1V to 3H:1V. For properly dewatered excavations, the installation of the municipal underground services may be undertaken within the confines of a prefabricated support system (trench box) designed and installed in accordance with OHSA.

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.

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 Bedrock Excavation

The excavations are anticipated to extend into the bedrock. Excavations within the weathered zone of the bedrock and for shallow excavations into the competent sound bedrock may be excavated using a hoe ram for the removal of small quantities of the bedrock; however, this process is expected to be very slow. The excavation of the competent sound limestone bedrock to extensive depths below the bedrock surface will likely require line drilling and blasting techniques. Contractors bidding on this project should decide on their own the most preferred rock removal method; hoe ramming or line drilling and blasting.

The excavation side slopes in the weathered limestone bedrock may be cut back at a 1H:1V gradient from the bottom of the weathered bedrock zone.

Excavations within the sound bedrock may be undertaken with near vertical sides subject to review by a geotechnical engineer. The rock face of the excavation may require support in the form of shotcreting, wire mesh and/or rock bolts. The need for and type of rock support is best determined during on-site examination of the bedrock during excavation operations.

It is recommended that a pre-construction condition survey of the nearby buildings and the surrounding infrastructure located within the construction zone of influence be undertaken prior to any earth (soil) and rock excavation work as well as vibration monitoring during excavation, blasting and construction operations. Prior to the commencement of blasting, a detailed blast methodology should be submitted by the Contractor.

Vibration monitors should be installed in critical areas of adjacent buildings and infrastructure located within the construction zone of influence to monitor the vibration levels and set up to provide automated "alert" and "stop work" notifications if the permissible vibration levels are exceeded. The vibration limits should comply with City of Ottawa Special Provisions No. F-1201 (Use of Explosives) requirements.

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

10.4 De-Watering Requirements

Excavations above the groundwater may be dewatered by conventional sump pumping techniques. The dewatering of unshored and shored excavations below the groundwater level may also be removed by collecting the water at low points within the unshored and shored excavations and pumping from sumps. In areas of high infiltration, a higher seepage rate should be anticipated and high-capacity pumps may be required to keep the excavation dry.

For construction dewatering, an Environmental Activity and Sector Registry (EASR) approval may be obtained for water takings greater than 50 m^3 and less than 400 m^3 per day. If more than 400 m^3 per day of groundwater are generated for dewatering purposes, then a Category 3 Permit to Take Water (PTTW) must be obtained from the Ministry of the Environment, Conservation and Parks (MECP). A Category 3 PTTW would require a complete hydrogeological assessment and would take at least 90 days for the MECP to process once the application is submitted. Reference is made to the EXP hydrogeological assessment report for additional comments and recommendations regarding EASR and PTTW.

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

11. Pipe Bedding Requirements

It is anticipated that the subgrade for the proposed underground services will consist of limestone bedrock.

The pipe bedding including material specifications, thickness of cover material and compaction requirements should conform to the relevant OPSS or municipality specifications, drawings and special provisions. The bedding and cover material should be compacted to a minimum of 95 percent standard Proctor maximum dry density (SPMDD). It is recommended that the pipe bedding be a minimum 150 mm thick and consist of OPSS Granular A. The bedding material should also be placed along the sides and on top of the pipe to provide a minimum cover thickness of 300 mm.

In areas where the subgrade consists of weathered bedrock with slabs or pieces of rock that may contain voids, it is recommended that the voids be filled with OPSS Granular A material and the surface of the filled in bedrock be covered with a separation membrane, such as Terrafix 270 R or equivalent, prior to the placement of the pipe bedding material.

To minimize the potential for bedding stresses within the pipe, a transition zone treatment should be provided in areas where the pipe subgrade changes from overburden to bedrock and vice versa. In areas where the surface of the bedrock slopes at a steeper gradient than 3H:1V, the bedrock should be excavated and additional bedding material placed to create a 3H:1V transition zone.

In areas where paved surfaces will be located over service trenches, it is recommended that the trench backfill material within the 1.8 m frost zone, should match the existing material exposed along the trench walls to minimize differential frost heaving of the subgrade. The trench backfill should be placed in 300 mm thick lifts and each lift should be compacted to 95 percent SPMDD. Alternatively, frost tapers may be used.

The underground 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 and bedrock to be excavated are anticipated to consist of surficial and buried topsoil, fill, silty sand to sandy silt and limestone bedrock (with shale partings). From a geotechnical perspective, these soils and the limestone bedrock are not considered suitable for -re-use as backfill material for this project and would have to be discarded.

Reference is made to the EXP soil management/excess soil characterization or additional comments regarding the environmental aspects of the soils.

It is anticipated that the material required for backfilling purposes in the interior and exterior of the proposed new buildings, trench backfill and to raise the grades at the site would have to be imported and should preferably conform to the following specifications:

- Engineered fill under the floor slab, including backfilling of service and footing trenches inside the building - OPSS Granular B Type II placed in maximum 300 mm thick lifts and each lift compacted to 100 percent SPMDD,
- Backfill material against exterior side of foundation walls – OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD,
- Trench backfill and subgrade fill should consist of OPSS Select Subgrade Material (SSM) for the parking lots and access roads, 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

13.1 Pavement Structures Over Soil and Bedrock Subgrades for Access Roads and Parking Facilities

The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. The subgrade is anticipated to consist of imported fill OPSS Granular B Type II material or select subgrade material (SSM) to raise the grades to the design subgrade level of the pavement structures.

Pavement structure thicknesses required for the proposed roads and parking facilities were computed and are shown on Table V. The 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.

Table V: Recommended Pavement Structure Thicknesses - Soil and Bedrock Subgrades

Pavement Layer	Compaction Requirements	Pavement Design to be Used by Light Duty Vehicles	Heavy Duty Vehicles / Subdivision Roads
Asphaltic Concrete (PG 58-34)	91.5-97 percent MRD	40 mm HL3/SP12.5 Cat B 50 mm HL8/SP12.5	50 mm HL3/SP12.5 Cat B 60 mm HL8 SP19.0 Cat B
OPSS 1010 Granular A Base	100 percent SPMDD	150 mm	150 mm
OPSS 1010 Granular B Sub-Base Type II	100 percent SPMDD	300 mm	300 mm

Notes for Table XIII:

1) SPMDD denotes standard Proctor maximum dry density (SPMDD).
2) MRD denotes Maximum Relative Density (MRD)
3) The upper 300 mm of the subgrade fill should be compacted to 98 percent SPMDD.
4) The approved subgrade should be covered with a geotextile prior to the placement of the sub-base material.

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 may be required in addition to the geotextile indicated in Table XX.

Additional comments on the construction of the parking areas and access roads are as follows:

1. 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 proofrolled 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 1010 Granular B Type II compacted to 95 percent SPMDD (ASTM D698).
2. 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.
3. 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 should be installed on both sides of the access road(s). Subdrains must be installed in the proposed parking areas and on both sides of the

roadways at low points and should be continuous between catchbasins 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.

4. 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 91.5 to 97 percent of the maximum relative density in accordance with ASTM D2041.

13.2 Pavement Structure Constructed Over Parking Garage Structure (Podium Slab)

The recommended pavement structures constructed on top of the parking garage structure (podium slab) are shown in Table VI. The final design of the total thickness of the pavement structure will depend on the total thickness available for the pavement structure on top of the concrete podium. Once the available thickness or space for the pavement structure is known, EXP can provide additional comments and recommendations regarding the pavement structure on the concrete podium.

Table VI: Recommended Pavement Structure Thicknesses – Pavement Constructed Over Parking Garage Structure (Podium Slab)

Pavement Layer	Compaction Requirements	Light Duty Parking Areas	Heavy Duty Parking Areas and Access Roads
Asphaltic Concrete (PG 58-34)	Minimum 91.5 percent to 97 percent MRD	50 mm – SP12.5 Cat B or HL3	40 mm – 12.5 Cat B/HL3 50 mm – 19.0 Cat B/HL8
Granular A Base (OPSS 1010) (crushed limestone)	100 percent SPMDD	300 mm	300 mm

SPMDD denotes Standard Proctor Maximum Dry Density, ASTM-D698-12e2
MRD denotes Maximum Relative Density, ASTM D2041

The granular materials used for pavement construction should conform to Ontario Provincial Standard Specifications (OPSS) for Granular A and Granular B Type II and should be compacted to 100 percent SPMDD. The asphaltic concrete and its placement should meet OPSS 1151 requirements. It should be placed and compacted to OPSS 311 and 313.

13.3 General Comment for Pavement Structures

It is recommended that EXP be retained to review all final pavement structure designs 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 limited to pH, sulphate, chloride and resistivity were undertaken on three (3) sections of selected bedrock cores and the test results will be provided in the final geotechnical report.

15. Tree Planting Restrictions

Since sensitive compressible clays were not encountered at the site, there are no restrictions to tree planting from a geotechnical perspective.

16. Additional Test Pits

In Test Pit No. 25-08, bedrock was not encountered to the test pit termination depth of 4.3 m (Elevation 85.1 m). In Borehole No. 25-08 located approximately 3.0 m east of Test Pit No. 25-08, bedrock as encountered at a 1.7 m depth (Elevation 87.7 m). Since the bedrock depth varies at Test Pit No. 25-08 and at Borehole No. 25-08, it is recommended that additional test pits be conducted in the vicinity of Test Pit No. 25-08 and at Borehole No. 25-08 using a large excavator to better delineate the bedrock depth (elevation) in the vicinity of these test holes. Based on the findings from the additional test pits, the geotechnical engineering comments and recommendations of this geotechnical report may need to be updated.

It is recommended that a second set of groundwater level measurements be taken for the final geotechnical report for this project.

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17. General Comments

The comments given in this report are intended only for the guidance of design engineers. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual test hole 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. Reference is made to the EXP soil management/excess soil characterization and hydrogeological assessment report regarding 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,

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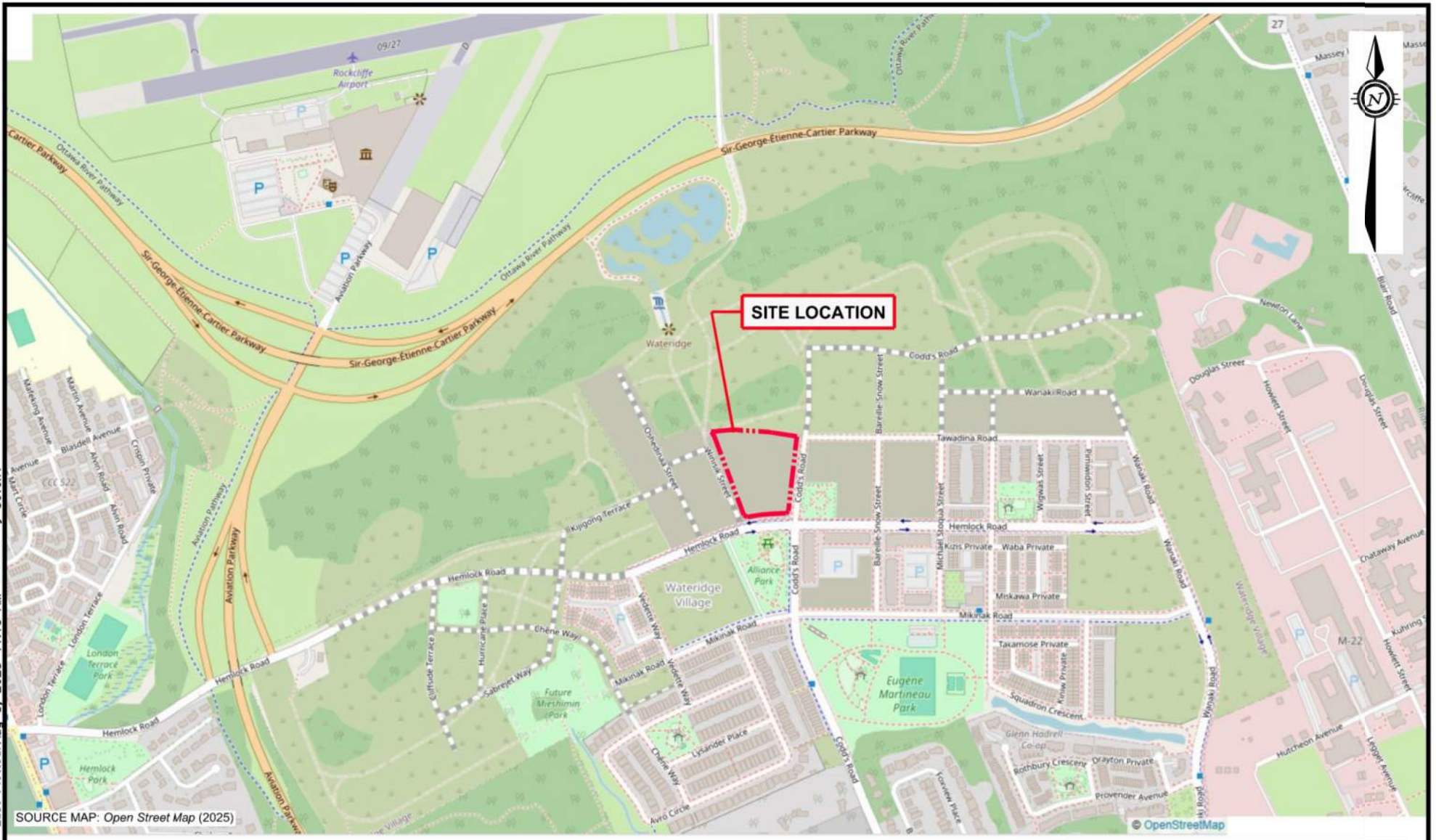
Earth and Environment

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

Figures



LEGEND

APPROXIMATE PROPERTY BOUNDARY

ORIGINAL SHEET SIZE = 11" X 8.5"

0 100m 200m 400m

HORIZONTAL 1:10,000

EXP Services Inc. www.exp.com
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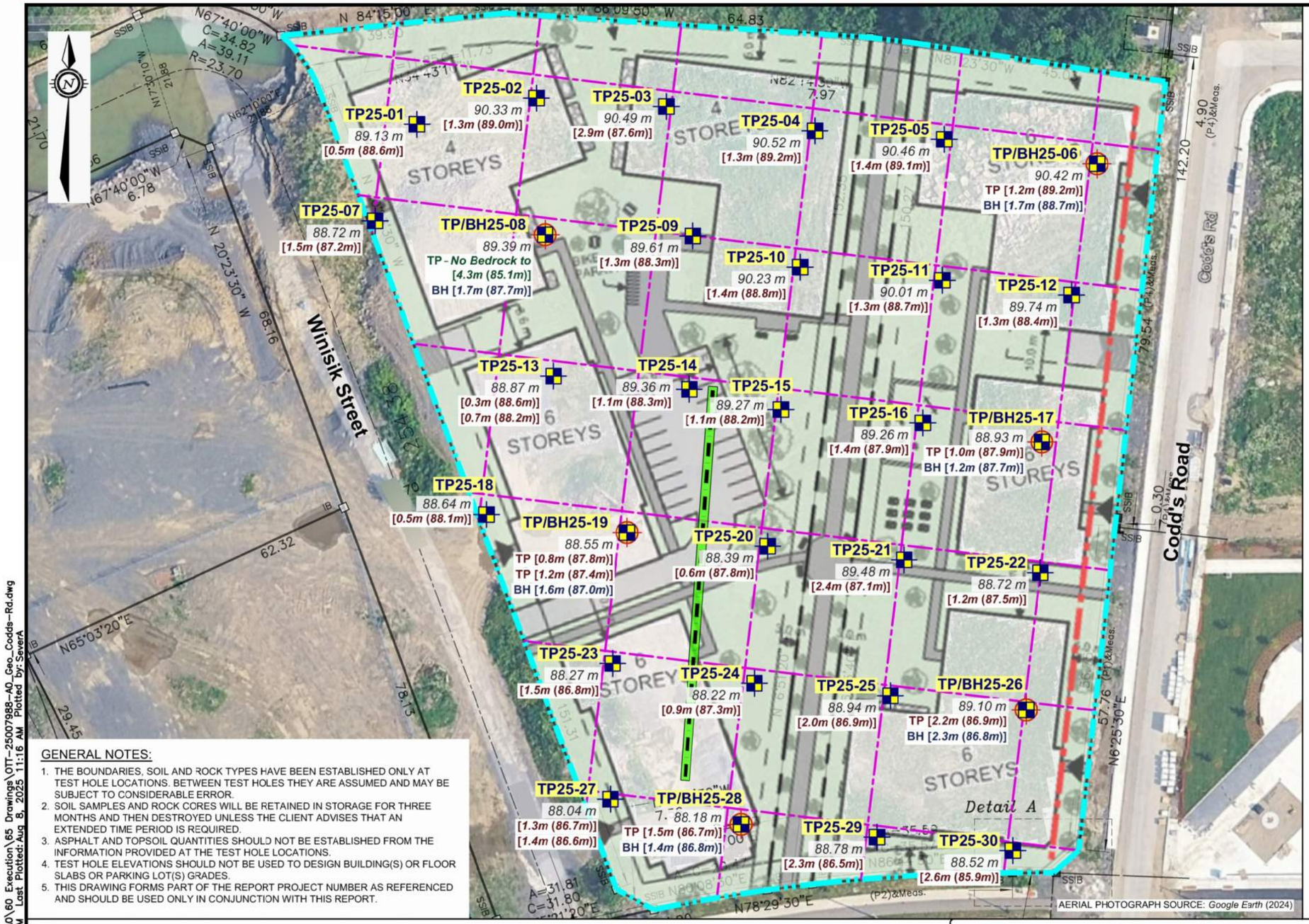
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

DATE: AUGUST 2025	PROPERTY ADDRESS:	BLOCKS 1 TO 3, CODD'S ROAD, OTTAWA, ONTARIO	project no. OTT-25007988-A0
DESIGN: SP / CHECKED: IT	PROJECT:	PROPOSED RESIDENTIAL DEVELOPMENT	scale 1:10,000
DRAWN BY: AS	TITLE:	SITE LOCATION PLAN	FIG 1

Filename: E:\OTT\OTT-25007988-A0\60 Execution\65 Drawings\OTT-25007988-A0_Geo_Codds-Rd.dwg
Last Saved: Aug 7, 2025 12:59 PM Last Plotted: Aug 8, 2025 11:15 AM Plotted by: SeverA



Test Pit No. (TP)	Borehole No. (BH)	Ground Surface Elev. (m)	Bedrock Depth (Elevation) (m)
25-01		89.13	0.5 (88.6)
25-02		90.33	1.3 (89.0)
25-03		90.49	2.9 (87.6)
25-04		90.52	1.3 (89.2)
25-05		90.46	1.4 (89.1)
25-06	**25-06**	**90.42**	**TP = 1.2 (89.2)**
			BH = 1.7 (88.7)
25-07		88.72	1.5 (87.2)
25-08	**25-08**	**89.39**	**TP = *No Bedrock to* 4.3 (85.1)**
			BH = 1.7 (87.7)
25-09		89.61	1.3 (88.3)
25-10		90.23	1.4 (88.8)
25-11		90.01	1.3 (88.7)
25-12		89.74	1.3 (88.4)
25-13		88.87	0.3 (88.6)
			0.7 (88.2)
25-14		89.36	1.1 (88.3)
25-15		89.27	1.1 (88.2)
25-16		89.26	1.4 (87.9)
25-17	**25-17**	**88.93**	**TP = 1.0 (87.9)**
			BH = 1.2 (87.7)
25-18		88.64	0.5 (88.1)
25-19	**25-19**	**88.55**	**TP = 0.8 (87.8)**
			TP = 1.2 (87.4)
			BH = 1.6 (87.0)
25-20		88.39	0.6 (87.8)
25-21		89.48	2.4 (87.1)
25-22		88.72	1.2 (87.5)
25-23		88.27	1.5 (86.8)
25-24		88.22	0.9 (87.3)
25-25		88.94	2.0 (86.9)
25-26	**25-26**	**89.10**	**TP = 2.2 (86.9)**
			BH = 2.3 (86.8)
25-27		88.04	1.3 (86.7)
			1.4 (86.6)
25-28	**25-28**	**88.18**	**TP = 1.5 (86.7)**
			BH = 1.4 (86.8)
25-29		88.78	2.3 (86.5)
25-30		88.52	2.6 (85.9)

GENERAL NOTES:

1. THE BOUNDARIES, SOIL AND ROCK TYPES HAVE BEEN ESTABLISHED ONLY AT TEST HOLE LOCATIONS. BETWEEN TEST HOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES AND ROCK CORES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. ASPHALT AND TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE TEST HOLE LOCATIONS.
4. TEST HOLE 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.

AERIAL PHOTOGRAPH SOURCE: *Google Earth* (2024)

LEGEND

- PROPERTY BOUNDARY
- 25m INTERVAL GRID (INITIAL)
- **TP25-01** TEST PIT NO. & LOCATION (2025)
- *89.13 m* GROUND SURFACE ELEVATIONS (m)
- **[*0.5m (88.6m*)]** BEDROCK DEPTH (ELEVATION) (m)
- APPROXIMATE LOCATION OF SEISMIC SURVEY LINE FROM GEOPHYSICS *GPR INTERNATIONAL INC.* (*GPR*) REPORT DATED JULY 16, 2025
- **TP/BH25-06** TEST PIT / BOREHOLE NO. & LOCATION (2025)
- **TP [*1.2m (89.2m*)]** BEDROCK DEPTH (ELEVATION) (m) AT TEST PIT
- **BH [*1.7m (88.7m*)]** BEDROCK DEPTH (ELEVATION) (m) AT BOREHOLE

ORIGINAL SHEET SIZE = 17" X 11"

0 5m 10m 30m

HORIZONTAL 1:750

EXP Services Inc. www.exp.com
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2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

DATE: AUGUST 2025	PROPERTY ADDRESS: BLOCKS 1 TO 3, CODD'S ROAD, OTTAWA, ONTARIO		project no. OTT-25007988-A0
DESIGN: SP / CHECKED: IT	PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT		scale 1:750
DRAWN BY: AS	TITLE: TEST HOLE LOCATION PLAN		FIG 2

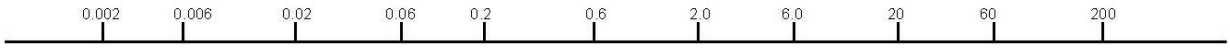
Filename: E:\OTT\OTT-25007988-A0\60 Execution\65 Drawings\OTT-25007988-A0_Geo_Codds-Rd.dwg
Last Saved: Aug 7, 2025 12:59 PM Last Plotted: Aug 8, 2025 11:16 AM Plotted by: SeverA

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 Test Pit TP-25-01

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~500 mm thick Mixture of silty sand and silty clay, gravel, cobbles and boulders, grey, moist, no odours, no stains	89.13	0		×	GS1	
			88.6					
		Bucket Refusal on Bedrock at 0.5 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-02

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~600 mm thick Silty sand to sandy silt mixed with topsoil containing roots and rootlets, some gravel, cobbles and boulders, brown, moist, no odours, no stains	90.33	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60	GS1	
			89.7					
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, moist		1				
			89.0					
		Bucket Refusal on Bedrock at 1.3 m Depth						

Note
1) One (1) sample and duplicate(DUP.1) submitted for environmental laboratory analyses.

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-03

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 5

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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 (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
		FILL Mixture of silty sand and silty clay, some gravel, blast shattered type cobbles and boulders, grey, damp to moist, no odours, no stains	90.49	0				
				1		×	GS1	
				2				
			87.6					
		Bucket Refusal on Bedrock at 2.9 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-04

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 6

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~1100 mm thick Mixture of silty sand and silty clay, some gravel, blast shattered type cobbles and boulders, asphalt pieces, brown, moist, no odours, no stains	90.52	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			89.4	1				
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, moist, no odours, no stains	89.2				GS1	
		Bucket Refusal on Bedrock at 1.3 m Depth						
		Note 1) One (1) sample submitted for environmental laboratory analyses.						

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

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

Log of Test Pit TP-25-05

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 7

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Mixture of silty sand and silty clay, some gravel, brown to dark brown, moist, no odours, no stains	90.46	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
		FILL Silty sand and crushed limestone, grey, moist, no odours, no stains underline by geotextile fabric at 1.2 m depth.	90.1	1		×	GS1	
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown and grey, moist, no odours, no stains	89.3 89.1					
		Bucket Refusal on Bedrock at 1.4 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-06

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 8

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~700 mm thick Mixture of silty sand and silty clay, some gravel, blast - shattered type cobbles and boulders, asphalt pieces, brown to dark brown, moist, no odours, no stains	90.42	0	20 40 60 80 50 100 150 200 kPa	250 500 750 20 40 60	GS1	
			89.7					
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, moist, no odours, no stains	89.2	1				
		Bucket Refusal on Bedrock at 1.2 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Borehole BH25-06

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks1 to 3, Codd's Road,Ottawa, Ontario

Figure No. 8A

Page. 1 of 1

Date Drilled: 'July 23, 2025

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: SA 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
		Power Augered from ground surface to 1.7m depth. Refer to Test Pit No. TP25-06, Figure 8, for subsurface soil conditions from ground surface to 1.7 m depth.	90.42	0
		LIMESTONE BEDROCK With dark grey to black shale partings, grey With limestone rubble zone from 1.7m to 2.0m depths.	88.7	2
▼			84.52	6
		Borehole Terminated at 6.5 m Depth	83.9	

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: RUN1, RUN2, RUN3, RUN4

Natural Unit Wt. kN/m³

LOG OF BOREHOLE CODD'S RD BHS.GPJ TROW OTTAWA.GDT 8/8/25

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 38 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-25007988-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'August 8, 2025	5.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.7 - 3.2	76	46
2	3.2 - 4.7	65	69
3	4.7 - 5.9	82	13
4	5.9 - 6.5	42	33

Log of Test Pit TP-25-07

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 9

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~900 mm thick Mixture of silty sand and silty clay, cobbles, boulders, asphalt pieces, brown and grey, no odours, no stains	88.72	0
		SANDY SILT Some gravel, trace clay, gray, moist, no odours, no stains	87.8	1
		Bucket Refusal on Bedrock at 1.5 m Depth	87.2	

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
GS1	
GS2	

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-08

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 10

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Mixture of silty sand and silty clay, with gravel, blast shattered type cobbles and boulders, asphalt pieces, voids, brown and grey, moist, no odours, no stains	89.39	0
				1
				2
				3
				4
			85.1	
		Test Pit Terminated at 4.3 m Depth		

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Borehole BH25-08

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks1 to 3, Codd's Road,Ottawa, Ontario

Figure No. 10A

Page. 1 of 1

Date Drilled: 'July 24, 2025

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: SA 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
		Power Augered from ground surface to 1.3m depth. Refer to Test Pit No. TP25-08, Figure 10, for subsurface soil conditions from ground surface to 1.3 m depth.	89.39	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			88.1	1				
		COBBLES AND BOULDERS/ WEATHERED LIMESTONE BEDROCK	87.7				RUN1	
		LIMESTONE BEDROCK With dark grey to black shale partings, grey 12mm and 25mm thick brown soil filled seams from 2.5m to 2.7m depths.		2			RUN2	
				3				
				4			RUN3	
				5			RUN4	
			83.56					
		Borehole Terminated at 6.1 m Depth	83.3	6				

LOG OF BOREHOLE CODD'S RD BHS.GPJ TROW OTTAWA.GDT 8/8/25

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 38 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-25007988-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'August 8, 2025	5.8	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.3 - 1.7		
2	1.7 - 3.2	87	20
3	3.2 - 4.7	98	53
4	4.7 - 6.1	100	47

Log of Test Pit TP-25-09

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 11

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~800 mm thick Mixture of silty sand and gravel with grey clay clumps, cobbles, boulders, asphalt pieces, brown, moist, no odours, no stains	89.61	0		×	GS1	
		FILL Silty sand to sandy silt, with some gravel and grey clay clumps, cobbles, boulders, brown to dark brown layers, no odours, no stains	88.8	1		×	GS2	
		Bucket Refusal on Bedrock at 1.3 m Depth	88.3					

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-10

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 12

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Silty sand and crushed gravel, grey, moist, no odours, no stains	90.23	0	20 40 60 80 50 100 150 200 kPa	250 500 750 20 40 60		
				1				
			88.8					
		Bucket Refusal on Bedrock at 1.4 m Depth **Note** 1) One (1) sample submitted for environmental laboratory analyses.						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-11

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 13

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~400 mm thick Mixture of silty sand and silty clay, some gravel, blast shattered type cobbles and boulders, roots and rootlets, brown, moist no odours, no stains	90.01	0	20 40 60 80 Shear Strength kPa 50 100 150 200	250 500 750 Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	GS1	
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, moist, no odours, no stains	89.6	1				
		Bucket Refusal on Bedrock at 1.3 m Depth	88.7					

Note

1) One (1) sample and a duplicate (Dup.2) sample submitted for environmental laboratory analyses.

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-12

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 14

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN Checked by: SMP

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

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
		FILL Silty sand and gravel, blast shattered type cobbles and boulders, asphalt pieces, black plastic pipe pieces, brown, moist, no odours, no stains	89.74	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		SANDY SILT Some gravel, cobbles and boulders, no odours, no stains	88.7 / 88.4	1				
		Bucket Refusal on Bedrock at 1.3 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-13

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 15

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~500 mm thick Mixture of silty sand and gravel and silty clay, roots and rootlets, asphalt and wood pieces, brown, moist, no odours, no stains	88.87	0			GS1	
		FILL Silty sand, some gravel and cobbles, brown, moist, no odours, no stains	88.4 88.2				GS2	
		Bucket Refusal on Bedrock at 0.3 m and at 0.7m Depths						

Note

1) Bucket refusal met on bedrock at north side of the test pit at 0.7 m depth.

2) Bucket refusal met on bedrock at south side of the test pit at 0.3 m depth.

3) Two (2) samples submitted for environmental laboratory analyses.

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-14

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 16

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~300 mm thick Silty sand, some gravel, grey clay clumps, brown, moist no odours, no stains	89.36	0
		FILLL Silty sand to clayey sandy silt, brown to grey, moist, organic type odours, no stains	89.1	
			88.3	1
		Bucket Refusal on Bedrock at 1.1m Depth		

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
GS1	
GS2	

Note
1) Two (2) samples submitted for environmental laboratory analyses.

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-15

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 17

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~500 mm thick Silty sand and gravel, brown, moist no odours, no stains	89.27	0	20 40 60 80 50 100 150 200 kPa	250 500 750 20 40 60		
			88.8					
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, moist, no odours, no stains						
			88.2	1				
		Bucket Refusal on Bedrock at 1.1m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-16

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 18

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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 (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
		FILL Silty sand and gravel, some clay, cobbles, boulders, rootlets, asphalt pieces, brown, moist no odours, no stains	89.26	0				
				1		×	GS1	
			87.9					
		Bucket Refusal on Bedrock at 1.4 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-17

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 19

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~500mm thick Silty sand, trace gravel, grey clay clumps with roots, brown, moist, no odours, no stains	88.93	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60	GS1	
		FILL Clayey silt to silty clay, some sand and gravel, cobbles and boulders, brown, moist, no odours, no stains	88.4				GS2	
		Bucket Refusal on Bedrock at 1.0 m Depth **Note** 1) One (1) sample submitted for environmental laboratory analyses.	87.9	1				

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Borehole BH25-17

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks1 to 3, Codd's Road,Ottawa, Ontario

Figure No. 19A

Page. 1 of 1

Date Drilled: 'July 24, 2025

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: SA 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
		Power Augered from ground surface to 1.2m depth.	88.93	0				
		Refer to Test Pit No. TP25-17, Figure 19, for subsurface soil conditions from ground surface to 1.2 m depth.						
			87.7	1				
		LIMESTONE BEDROCK With dark grey to black shale partings, grey					RUN1	
		With vertical fracture from 4.9m to 5.1m depths.		2			RUN2	
		With limestone robble zone from 2.6 m to 2.7 m depths.		3				
				4			RUN3	
				5				
			83.01				RUN4	
			82.6	6				
		Borehole Terminated at 6.3 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

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 38 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-25007988-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'August 8, 2025	5.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.2 - 1.7	72	46
2	1.7 - 3.3	100	70
3	3.3 - 4.9	81	75
4	4.9 - 6.3	100	65

LOG OF BOREHOLE CODD'S RD BHS.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-18

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 20

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~500mm thick Silty sand and crushed gravel, trace rootlets, brown to grey, moist, no odours, no stains	88.64	0	20 40 60 80 50 100 150 200 kPa	250 500 750 20 40 60		
			88.1					
		Bucket Refusal on Bedrock at 0.5 m Depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-19

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 21

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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 (20 40 60 80 / 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
		FILL~600 mm thick Mixture of silty sand and silty clay, some gravel, asphalt pieces, brown and grey, moist, no odours, no stains	88.55	0		×	GS1	
				1		×	GS2	
			87.4					
		Bucket Refusal at 0.8 m and at 1.2m Depths **Note** 1) Bucket refusal met on bedrock at north side of the test pit at 0.8 m depth. 2) Bucket refusal met on bedrock at south side of the test pit at 1.2 m depth. 3) An abondoned service trench with black pipe located in the middle of the test pit with bedrock at 1.2 m depth. 4) One (1) sample submitted for environmental laboratory analyses.						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Borehole BH25-19

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks1 to 3, Codd's Road,Ottawa, Ontario

Figure No. 21A

Page. 1 of 1

Date Drilled: 'July 19, 2025

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: SA 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
		Power Augered from ground surface to 1.6m depth. Refer to Test Pit No. TP25-19, Figure 21, for subsurface soil conditions from ground surface to 1.6 m depth.	88.55	0
		LIMESTONE BEDROCK With dark grey to black shale partings, grey With 12mm and 25mm thick brown and grey soil filled seams and vertical fractures from 2.9 m to 3.1m depths.	87.0	1
				2
				3
			82.88	4
				5
				6
			81.4	7
		Borehole Terminated at 7.2 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: RUN1, RUN2, RUN3, RUN4

Natural Unit Wt. kN/m³

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 38 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-25007988-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'August 8, 2025	5.7	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.6 - 2.7	93	78
2	2.7 - 4.2	91	35
3	4.2 - 5.7	100	68
4	5.7 - 7.2	98	95

LOG OF BOREHOLE CODD'S RD BHS.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-20

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 22

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		TOPSOIL~200mm thick	88.39	0				
		SILTY SAND TO SANDY SILT Some gravel, brown, moist, no odours, no stains	88.2					
			87.8					
		Bucket Refusal on Bedrock at 0.6 m Depth						
		Note 1) One (1) sample submitted for environmental laboratory analyses.						

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-21

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 23

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~600 mm thick Silty sand, some gravel, rootlets, dark grey to black, moist, no odours, no stains	89.48	0
		FILL~600 mm thick Mixture of silty sand and silty clay, some gravel, no odours, no stains	88.9	
		TOPSOIL~400mm thick	88.3	1
		SILTY SAND Some gravel and clay, some cobbles and boulders, brown, moist, no odours, no stains	87.9	
		Bucket Refusal on Bedrock at 2.4 m Depth	87.1	2

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
GS1	
GS2	

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-22

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 24

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~700 mm thick Silty sand and gravel, brown, moist, no odours, no stains	88.72	0
			88.0	
		TOPSOIL~200mm thick	87.8	
		SILTY SAND Some gravel, weathered bedrock pieces, brown and grey, no odours, no stains	87.5	1
		Bucket Refusal on Bedrock at 1.2 m Depth		

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-23

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 25

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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~75mm thick	88.27	0
		GRANULAR FILL(BASE)~125mm thick	88.2	
		Silty sand and crushed gravel, grey, damp, no odours, no stains	88.1	
		FILL Silty sand and gravel, some blast shattered type cobbles and boulders, brown, moist, no odours, no stains	87.4	1
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, no odours, no stains	86.8	
		Bucket Refusal on Bedrock at 1.5 m Depth		

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-24

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 26

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL~500 mm thick Silty sand, some crushed gravel, cobbles, plastic bag type pieces, brown, moist, no odours, no stains	88.22	0
		TOPSOIL~200mm thick	87.7	
		FILL Mixture of silty sand and silty clay, trace roots and rootlets, brown, moist, no odours, no stains	87.5	
		Bucket Refusal on Bedrock at 0.9 m Depth	87.3	

Note
1) Two (2) samples submitted for environmental laboratory analyses.

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
GS1	
GS2	

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-25

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 27

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Silty sand and gravel, blast shattered type cobbles and boulders, asphalt and brick pieces, brown, moist, no odours, no stains	88.94	0
		ORGANIC FILL~700mm thick Silty sand and gravel, roots, rootlets, brick pieces, dark brown to black, organic type odours, no stains	87.7	1
		SANDY SILT Some gravel, trace clay, brown,moist, no odours, no stains	87.0 86.9	2
		Bucket Refusal on Bedrock at 2.0 m Depth		

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-26

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 28

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Silty sand, some crushed gravel, grey clay clumps, trace rootlets, dark brown, damp to moist, no odours, no stains	89.1	0
		ORGANIC FILL~800mm thick Silty sand and gravel, roots and rootlets, dark brown to black, organic type odour, no stains	88.1	1
		SILTY SAND Trace gravel, brown, moist, no odours, no stains	87.3	2
		Bucket Refusal on Bedrock at 2.2 m Depth	86.9	

Note
1) One (1) sample submitted for environmental laboratory analyses.

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
GS1	
GS2	

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Borehole BH25-26

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks1 to 3, Codd's Road,Ottawa, Ontario

Figure No. 28A

Page. 1 of 1

Date Drilled: 'July 23, 2025

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: SA 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
		Power Augered from ground surface to 2.3m depth.	89.1	0
		Refer to Test Pit No. TP25-26, Figure 28, for subsurface soil conditions from ground surface to 2.3 m depth.		1
				2
		LIMESTONE BEDROCK	86.8	
		With dark grey to black shale partings, grey		3
		With 12mm thick- brown soil filled seams and vertical fractures from 3.5m to 3.7 m depths		4
▽			83.23	5
			82.8	6
		Borehole Terminated at 6.3 m Depth		

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: RUN1, RUN2, RUN3

Natural Unit Wt. kN/m³

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 38 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-25007988-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'August 8, 2025	5.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.3 - 3.3	99	61
2	3.3 - 4.7	83	24
3	4.7 - 6.3	100	71

LOG OF BOREHOLE CODD'S RD BHS.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-27

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 29

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		ORGANIC FILL Silty sand, some blast shattered cobbles and boulders, tree parts, roots and rootlets, plastic bag type pieces, dark brown, organic type odour, no stains	88.04	0				
		FILL Silty sand and crushed gravel, some clay, trace roots, brown and grey, no odours, no stains	87.6			×	GS1	
				1		×	GS2	
			86.7					
		Bucket Refusal on Bedrock at 1.3 m and 1.4 m Depths **Note** 1) An abandoned approximate 400mm wide service trench located in the middle of the test pit with bottom of trench below 1.4 m depth. 2) Bucket refusal met on bedrock at 1.3m at west side of test pit. 3) Bucket refusal met on bedrock at 1.4m at east side of test pit.						

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-28

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 30

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Silty sand and crushed gravel, some blast shattered type cobbles and boulders, brown, moist, no odours, no stains	88.18	0
		TOPSOIL~200mm thick	87.2	1
		SILTY SAND Some gravel, trace clay, moist, no odours, no stains	87.0	
		Bucket Refusal on Bedrock at 1.5 m Depth	86.7	

Note
1) Two (2) samples submitted for environmental laboratory analyses.

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Borehole BH25-28

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks1 to 3, Codd's Road,Ottawa, Ontario

Figure No. 30A

Page. 1 of 1

Date Drilled: 'July 19, 2025

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: SA 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
		Power Augered from ground surface to 1.4m depth. Refer to Test Pit No. TP25-28, Figure 30, for subsurface soil conditions from ground surface to 1.4 m depth.	88.18	0
			86.8	1
		LIMESTONE BEDROCK With dark grey to black shale partings, grey		2
			83.08	5
			81.0	7
		Borehole Terminated at 7.2 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: RUN1, RUN2, RUN3, RUN4

Natural Unit Wt. kN/m³

LOG OF BOREHOLE CODD'S RD BHS.GPJ TROW OTTAWA.GDT 8/8/25

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 38 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-25007988-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'August 8, 2025	5.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.4 - 2.6	86	89
2	2.6 - 4.2	96	78
3	4.2 - 5.6	100	76
4	5.6 - 7.2	84	84

Log of Test Pit TP-25-29

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 31

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Silty sand and crushed gravel, trace blast shattered cobbles and boulders, roots and rootlets, dark brown, moist, no odours, no stains	88.78	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60	GS1	
		FILL Silty sand and crushed gravel, grey, damp, no odours, no stains	88.3					
		ASPHALT~75mm thick	88.0					
		FILL Silty sand and crushed gravel, grey, damp, no odours, no stains	87.9					
		FILL Silty sand and gravel, brown, moist, no odours, no stains	87.8	1				
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, no odours, no stains	87.5				GS2	
		Bucket Refusal on Bedrock at 2.3 m Depth	86.5	2				

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Log of Test Pit TP-25-30

Project No: OTT-25007988-A0

Project: Proposed Residential Development

Location: Blocks 1 to 3, Codd's Road, Ottawa, Ontario

Figure No. 32

Page. 1 of 1

Date Drilled: 'July 7, 2025

Drill Type: Volvo EC 300 Excavator

Datum: Geodetic Elevation

Logged by: AN 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
		FILL Silty sand and crushed gravel, cobbles and boulders, ashpalt pieces, brown, moist, no odours, no stains	88.52	0
		TOPSOIL~300mm thick	87.5	1
		SANDY SILT Some gravel, trace clay, cobbles and boulders, brown, moist, no odours, no stains	87.2	
		Bucket Refusal on Bedrock at 2.6 m Depth	85.9	2
		Note 1) One (1) sample submitted for environmental laboratory analyses.		

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally packed in place using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-25007988-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'On completion'	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS 1-30 CODDS ROAD.GPJ TROW OTTAWA.GDT 8/8/25

Appendix A – Seismic Shear Wave Velocity Soundings Survey Report by GPR

GEOPHYSICS GPR INTERNATIONAL INC.

July 16th, 2025

Transmitted by email : ismail.taki@exp.com
Our ref : GPR25-06433-a

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
Codd's Road and Hemlock Road, Ottawa (ON)

[Project: OTT-25007988-A0]

Dear Mr. Taki,

Geophysics GPR International inc. has been mandated by **exp** Services inc. to carry out a seismic survey on a property located north-west of the intersection of Codd's Road and Hemlock Road, in Ottawa (ON). The geophysical investigation 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 soil and the rock, to determine the Site Designation.

The surveys were conducted on July 4th, 2025, by Mrs. Karyne Faguy, B.Sc. geophysics and Mr. Timothy Ward, tech. 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 survey design, the principles of the testing methods, 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 spreads were located between Codd's Road and Winisik Street (Figure 2). The geophone spacing was 3.0 metres for the main seismic line, using 24 geophones. Two shorter seismic spreads with geophone spacing of 0.5 and 1.0 metre were dedicated to the near surface materials. The seismic records were produced with a Terraloc PRO seismograph (from ABEM), and the geophones were 4.5 Hz.

The seismic records counted 4096 data, sampled at 1000 µs for the MASW surveys, and at 40 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

From seismic resonance the rock depth was calculated between 1.6 and 2.0 metres. From seismic refraction it was calculated between 2.0 and 2.7 metres (± 1 metre), and its seismic velocity (V_S) was calculated at 1540 m/s for its shallow part. These parameters were used for the initial geophysical models, prior to the inversions of the MASW analysis 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, such 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_{1266}, which corresponds to the Site Class "B". However, Site Classes A and B are not to be used if there is 3 metres or more of unconsolidated material between the rock and the bottom of the foundation. In such case, the appropriate site designation would be X_{760}.

In the case there would be 0.8 metre or less of soils between the rock and the foundation, the $\overline{V}_{S30}$ * value would be greater than 1500 m/s, corresponding to the Site Class A (Table 2).

CONCLUSION

Geophysical surveys were carried out to identify the Site Designation for a property located north-west of the intersection of Codd's Road and Hemlock Road, in Ottawa (ON). The seismic surveys used the MASW and the SPAC analysis to calculate the $\overline{V}_{S30}$ value and its calculation is presented at Table 1.

For the actual site, the Site Designation is X_{1266}, corresponding to the Site Class "B". (760 < $\overline{V}_{S30}$ ≤ 1500 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 Site Classes A and B are not to be used if there is 3 metres or more of unconsolidated material between the rock and the bottom of the foundation. In such case, the appropriate site designation would be X_{760}.

In the case there would be 0.8 metre or less of soils between the rock and the bottom of the foundation, the $\overline{V}_{S30}$ * value would be greater than 1500 m/s, corresponding to the Site Class A.

It must also 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,

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

LICENSED PROFESSIONAL ENGINEER
2025-07-16
J.-L. ARSENAULT
100148122
PROVINCE OF ONTARIO

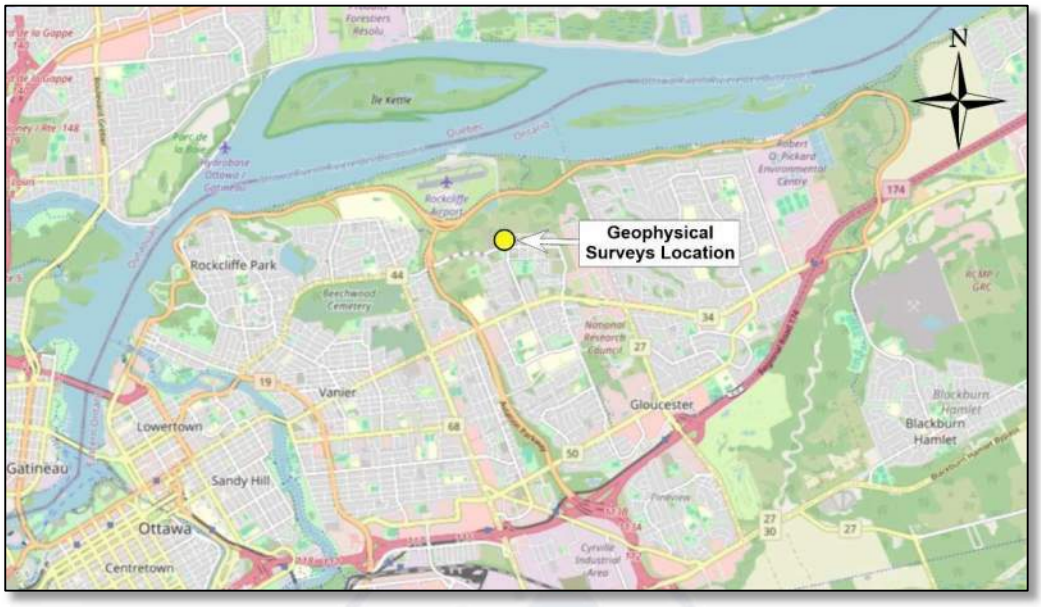


Figure 1: Regional location of the Site
(Source : OpenStreetMap©)

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

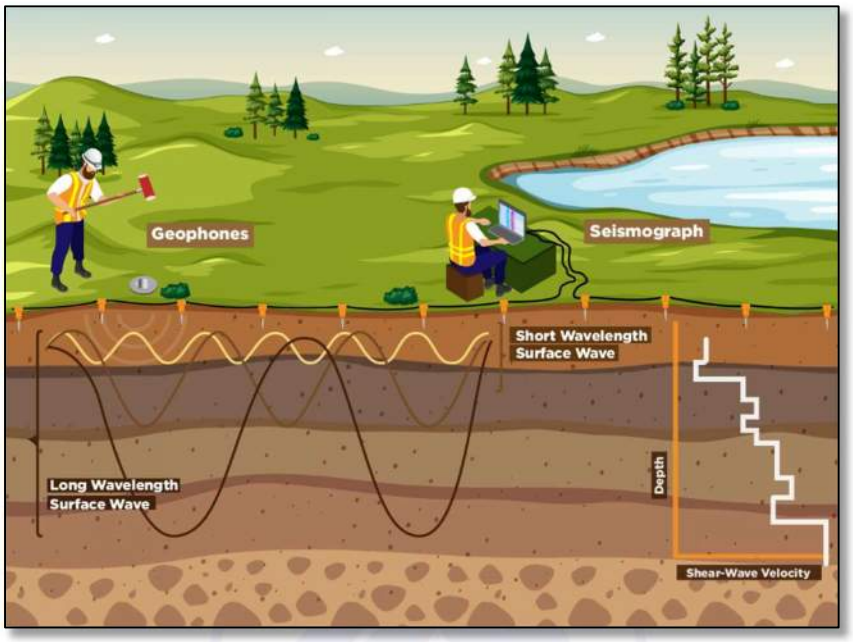


Figure 3: MASW Operating Principle

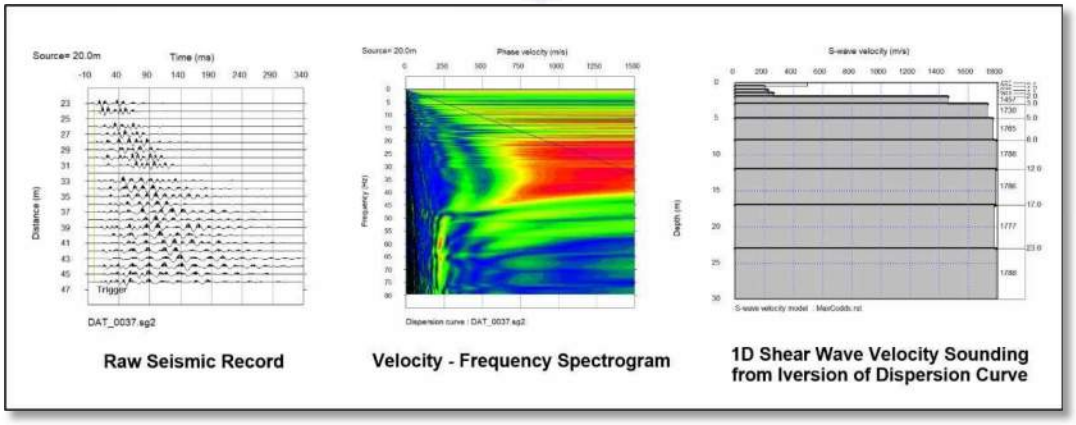


Figure 4: Example of a MASW/SPAC record, Phase Velocity - Frequency curve of the Rayleigh wave and resulting 1D Shear Wave Velocity Model

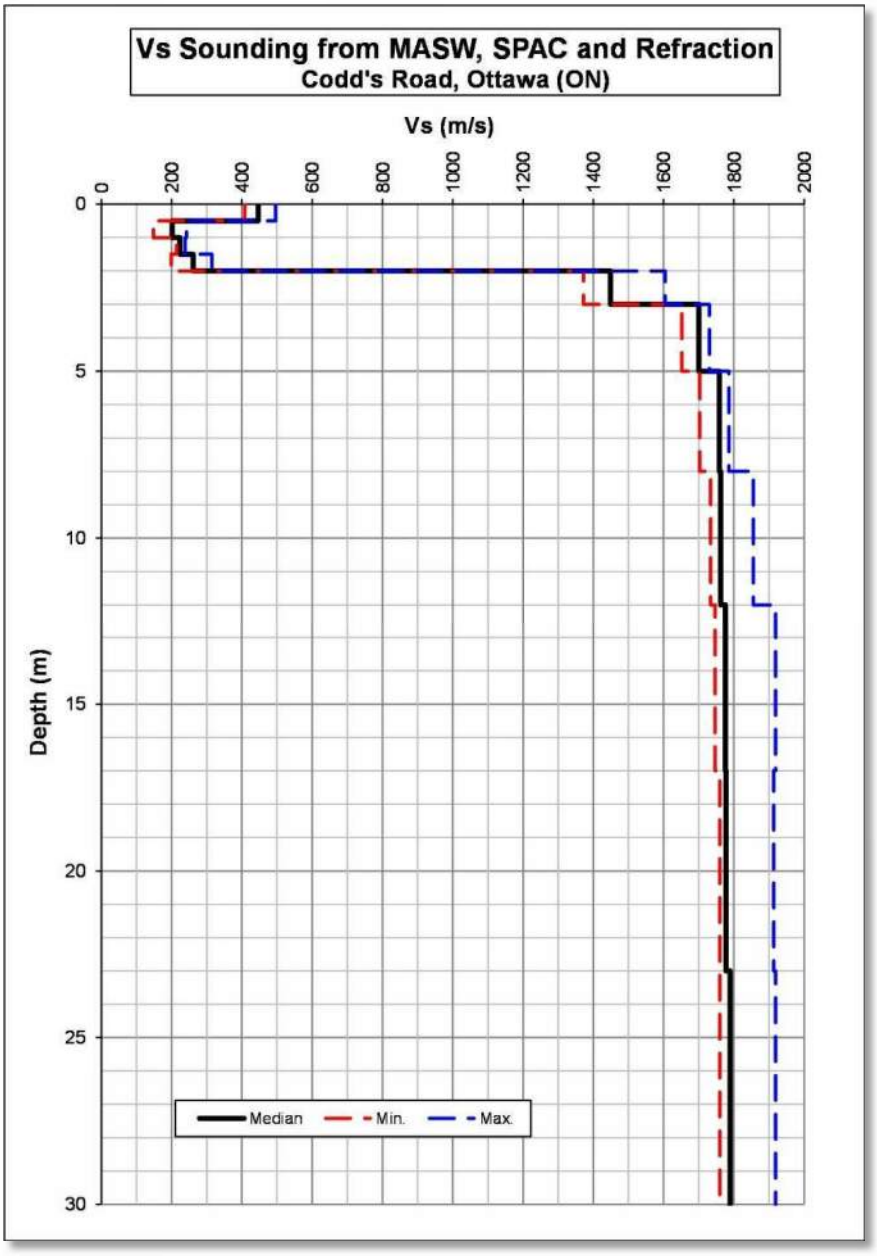


Figure 5: MASW Shear-Wave Velocity Sounding

TABLE 1
$\bar{V}_{S30}$ Calculation for the Site Class (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	408.1	446.1	495.8	**Grade Level (July 4th, 2025)**				
0.5	148.2	201.3	242.4	0.50	0.50	0.001121	0.001121	446.1
1.0	214.0	223.4	238.4	0.50	1.00	0.002483	0.003604	277.4
1.5	198.7	261.1	314.5	0.50	1.50	0.002238	0.005842	256.8
2.0	1372.2	1448.9	1604.1	0.50	2.00	0.001915	0.007757	257.8
3.0	1651.7	1700.3	1730.0	1.00	3.00	0.000690	0.008447	355.2
5.0	1702.8	1758.2	1785.9	2.00	5.00	0.001176	0.009623	519.6
8.0	1733.4	1761.9	1855.4	3.00	8.00	0.001706	0.011330	706.1
12.0	1746.3	1776.1	1918.4	4.00	12.00	0.002270	0.013600	882.4
17.0	1759.5	1777.2	1913.0	5.00	17.00	0.002815	0.016415	1035.6
23.0	1759.5	1789.5	1918.4	6.00	23.00	0.003376	0.019791	1162.1
30				7.00	30.00	0.003912	0.023703	1265.7

V_{S30} (m/s)	**1265.7**
Class	**B (1)**

(1) Site Classes A and B are not to be used if there is 3 metres or more of soils between the rock and the underside of the foundation. In such case, the appropriate site designation is X_{760}.

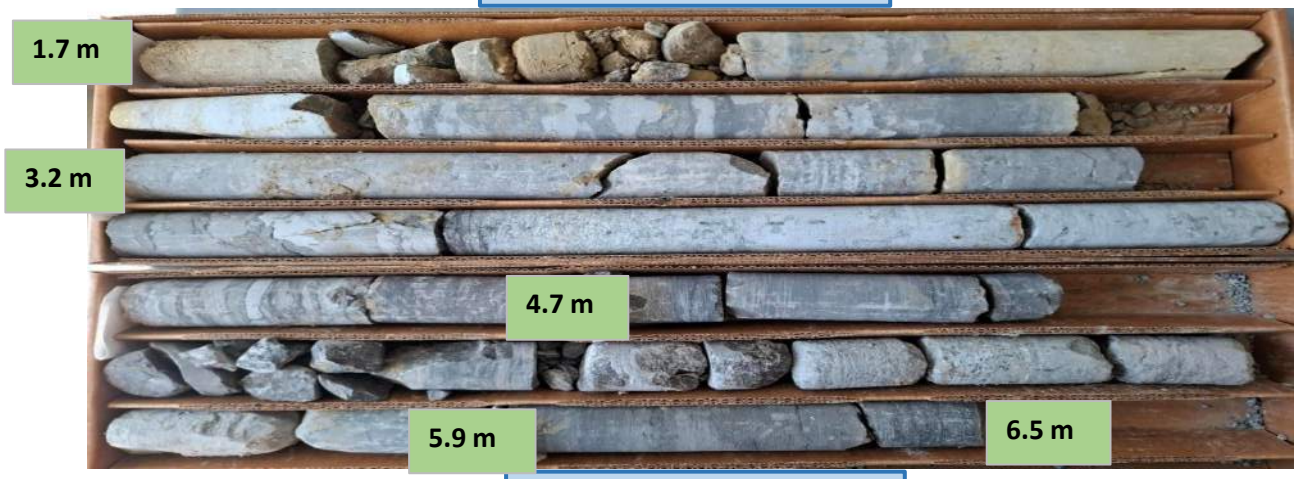
TABLE 2
Limit for the Site Class A

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	408.1	446.1	495.8	**Considering 0.8 metre of soils**				
0.5	148.2	201.3	242.4					
1.0	214.0	223.4	238.4					
1.2	214.0	223.4	238.4					
1.5	198.7	261.1	314.5	0.30	0.30	0.001343	0.001343	223.4
2.0	1372.2	1448.9	1604.1	0.50	0.80	0.001915	0.003257	245.6
3.0	1651.7	1700.3	1730.0	1.00	1.80	0.000690	0.003948	456.0
5.0	1702.8	1758.2	1785.9	2.00	3.80	0.001176	0.005124	741.6
8.0	1733.4	1761.9	1855.4	3.00	6.80	0.001706	0.006830	995.6
12.0	1746.3	1776.1	1918.4	4.00	10.80	0.002270	0.009100	1186.8
17.0	1759.5	1777.2	1913.0	5.00	15.80	0.002815	0.011916	1326.0
23.0	1759.5	1789.5	1918.4	6.00	21.80	0.003376	0.015292	1425.6
31.2				8.20	30.00	0.004582	0.019874	1509.5

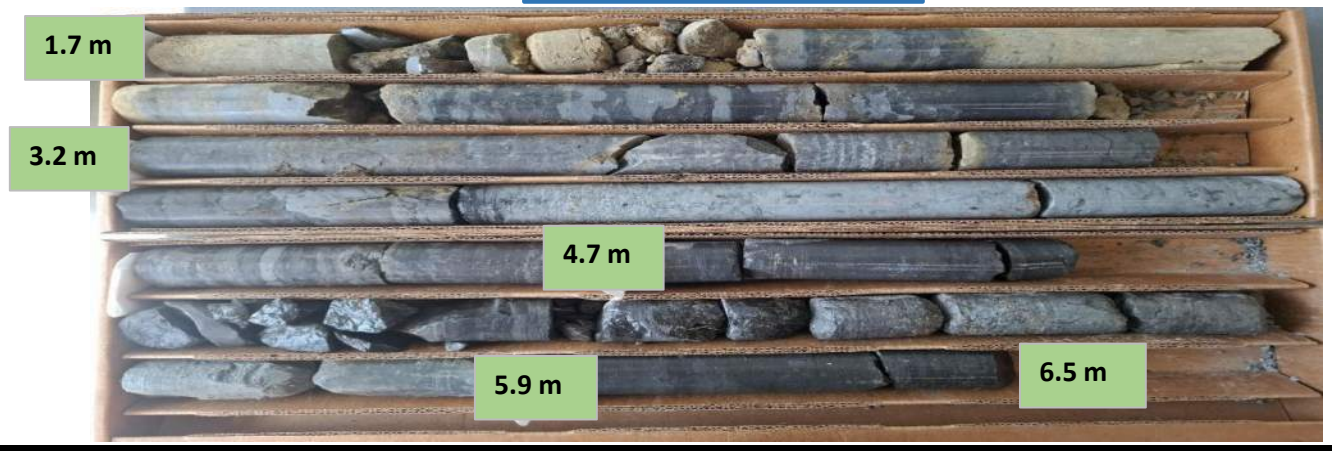
V_{S30}*	**1509.5**
Class	**A**

Appendix B – Bedrock Core Photographs

DRY BEDROCK CORES



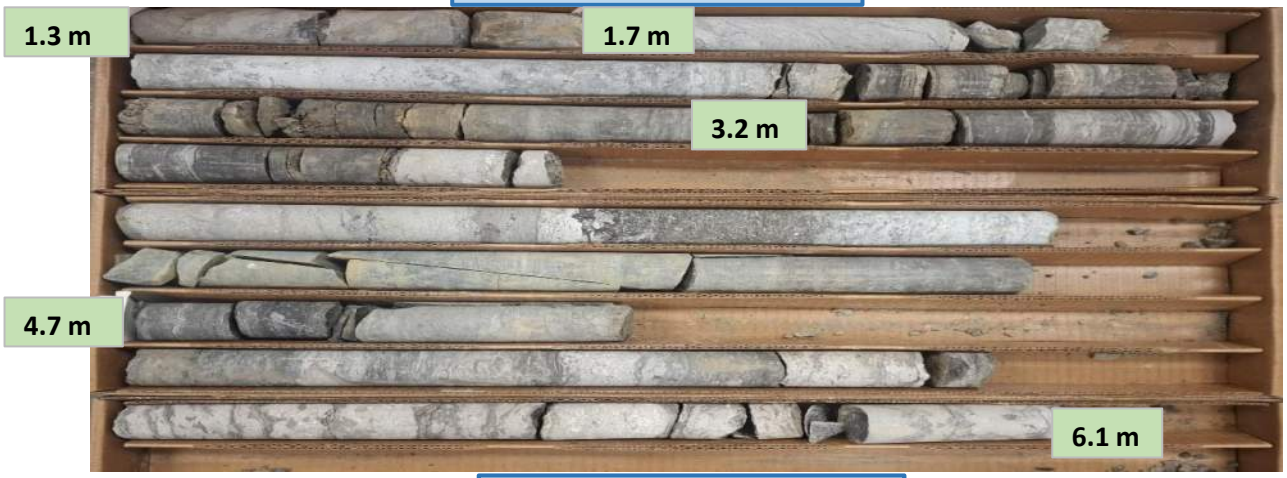
WET BEDROCK CORES



EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-06	Run 1: 1.7 m - 3.2 m Run 2: 3.2 m - 4.7 m Run 3: 4.7 m - 5.9 m Run 4: 5.9 m - 6.5 m	Proposed Residential Development, Blocks 1 to 3, Codd's Road, Ottawa, Ontario	OTT-25007988-A0
Date Cored Jul 23, 2025		Bedrock Core Photographs	FIG B-1

DRY BEDROCK CORES



WET BEDROCK CORES

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t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-08	Run 1: 1.3 m - 1.7 m Run 2: 1.7 m - 3.2 m Run 3: 3.2 m - 4.7 m Run4: 4.7 m - 6.1 m	Proposed Residential Development. Blocks 1 to 3, Codd's Road, Ottawa, Ontario	OTT-25007988-A0
Date Cored Jul 24, 2025		Bedrock Core Photographs	FIG B-2

DRY BEDROCK CORES

EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-17	Run 1: 1.2 m - 1.7 m Run 2: 1.7 m - 3.3 m Run 3: 3.3 m - 4.9 m Run 4: 4.9 m- 6.3 m	Proposed Residential Development, Blocks 1 to 3, Codd's Road,Ottawa, Ontario.	OTT-25007988-A0
Date Cored Jul 23, 2025		Bedrock Core Photographs	FIG B-3

WET BEDROCK CORES

EXP Services Inc. www.exp.com
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2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-17	Run 1: 1.2 m - 1.7 m Run 2: 1.7 m - 3.3 m Run 3: 3.3 m - 4.9 m Run 4: 4.9 m- 6.3 m	Proposed Residential Development, Blocks 1 to 3, Codd's Road,Ottawa, Ontario	OTT-25007988-A0
Date Cored Jul 23, 2025		Bedrock Core Photographs	FIG B-3a

DRY BEDROCK CORES

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Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-19	Run 1: 1.6 m - 2.7 m Run 2: 2.7 m - 4.2 m Run 3: 4.2 m- 5.7 m Run 4: 5.7 m - 7.2 m	Proposed Residential Development, Blocks 1 to 3, Codd's Road,Ottawa, Ontario	OTT-25007988-A0
Date Cored Jul 19, 2025		Bedrock Core Photographs	FIG B-4

WET BEDROCK CORES

EXP Services Inc. www.exp.com
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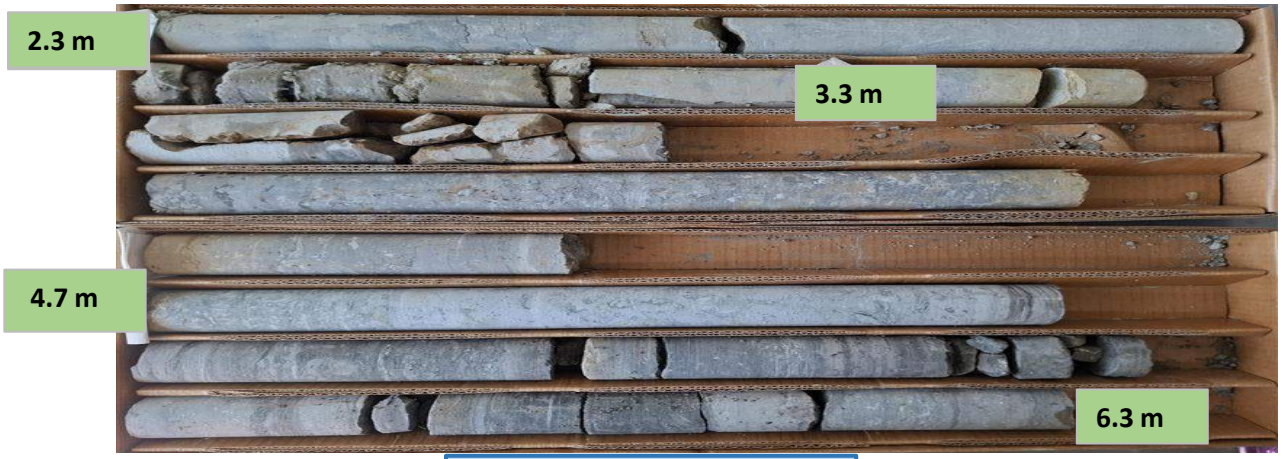
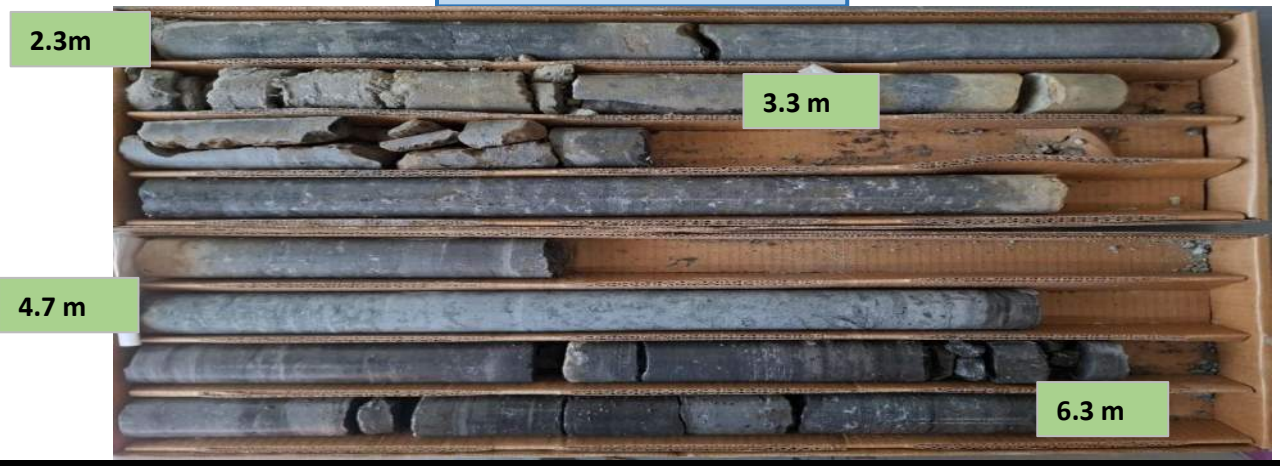
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-19	Run 1: 1.6 m - 2.7 m Run 2: 2.7 m - 4.2 m Run 3: 4.2 m- 5.7 m Run 4: 5.7 m - 7.2 m	Proposed Residential Development, Blocks 1 to 3, Codd's Road,Ottawa, Ontario	OTT-25007988-A0
Date Cored Jul 19, 2025		Bedrock Core Photographs	FIG B-4a

DRY BEDROCK CORES



WET BEDROCK CORES



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Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-26	Run 1: 2.3 m - 3.3 m Run 2: 3.3 m - 4.7 m Run 3: 4.7 m - 6.3 m	Proposed Residential Development, Blocks 1 to 3, Codd's Road,Ottawa, Ontario.	OTT-25007988-A0
Date Cored Jul 23, 2025		Bedrock Core Photographs	FIG B-5

DRY BEDROCK CORES

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Ottawa, ON K2B 8H6, Canada

Borehole No:	Core Runs	project	Project N0:
BH25-28	Run 1: 1.4 m - 2.6 m Run 2: 2.6 m - 4.2 m Run 3: 4.2 m - 5.6 m Run 4: 5.6 m - 7.2 m	Proposed Residential Development - Blocks 1 to 3, Codd's Road,Ottawa, Ontario	OTT-25007988-A0
Date Cored Jul 19, 2025		Bedrock Core Photographs	FIG. B-6

Legal Notification

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