11654128 Canada Inc.

Geotechnical Investigation

Type of Document
FINAL

Project Name
Proposed Residential Development
6171 Hazeldean Road, Ottawa, Ontario

Project Number
OTT-00258780-B0

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Date Submitted:
May 14, 2021 (supersedes July 24, 2020)

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Legal Notification

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Executive Summary

A geotechnical investigation was undertaken at the proposed residential development to be located at the site registered by the civic address of 6171 Hazeldean Road, City of Ottawa, Ontario. This work was authorized by Mr. Carmine Zayoun on behalf of 11654128 Canada Inc.

The geotechnical investigation was completed concurrently with a Phase I and Phase II Environmental Site Assessments (ESA), which are reported under separate covers.

Current plans call for the development of the subject site with residential buildings comprising of one nine (9) storey mixed used building with multi levels of underground parking, five (5) blocks of four (4) story condominium buildings with one to two levels of underground parking each, townhome blocks and single homes with one basement level. Amenities buildings, storm management pond, park, underground services and subdivision roadways will be also constructed as part of the proposed development.

Latest grading plans available indicates the proposed site grades along the roadways will vary from Elevation 122.22 m to Elevation 120.30 m along the west end of the site and from Elevation 118.0 m to Elevation 118.4 m along the east end of the site. A grade raise up to 3 m is proposed at the site as the results of the proposed development.

The fieldwork for the geotechnical investigation was completed in stages and comprised the drilling/excavation a total of sixteen (16) boreholes (Borehole Nos. 1 to 16) using a CME-55 track mounted drill rig and the excavation of thirty-six (36) test pits (Test Pit Nos. 1 to 36) using a 320 excavator to termination depths ranging between 0.2 m to 10.8 m below the existing ground surface. Monitoring wells and standpipes were installed in eight (8) boreholes for long-term monitoring of the groundwater at the site.

The investigation has revealed that the subsurface conditions at the site to comprise of 0.3 m to 3.4 m thick heterogenous fill deposit over the entire site extending to the surface of bedrock in the majority of the test holes and to the surface of a deposit of native silty sand/glacial till in localized areas of the site as described in detail in the main body of the report. Deposit of marl/clay crust and peat was encountered in the southern part of the site as well as in localized pockets in other areas of the site Refusal to augers/excavator bucket was met in all the test holes at depths ranging between 0.3 and 6.2 (Elevation 114.3 to 119.1 m). Washboring and core drilling used to advance Borehole Nos. 1 to 3 and 7 to 13 beyond the refusal depths revealed that the refusal was met on very strong limestone bedrock.

Groundwater measurements taken on March 1 in monitoring wells and standpipes installed in some of the boreholes indicate that the groundwater table to be at a depth of 1.34 to 3.6 m below grade, i.e., Elevation 117.31 m to 113.61. The groundwater table is subject to seasonal fluctuation and may be at higher depths during wet weather conditions. Groundwater infiltration was recorded in some of the test pits following the excavation as indicated in the report.

Available grading plans indicates that the grades at the site will be raised by up to 3 m which is considered acceptable from a geotechnical point of view.

The heterogenous fill encountered throughout the site, peat and marl are not considered suitable as founding material for the proposed residential development and roadways and therefore must be excavated

and replaced with engineered fill as described in detail on the main body of the report. It may be possible to leave some of the fill in place under the roadway pending further evaluation in the field and if peat and marl does not exist below the fill. It may be possible to leave the peat and marl as well as the fill in the area of the proposed park. For budgeting purpose, it should be assumed that all fill, peat and marl will require removal from the envelopes of the proposed buildings and roadways and replaced with engineered fill as per the final grading plan and the recommendation of the report.

Based on proposed grading and various type of structures, the founding medium throughout the site may vary from founding on surface of bedrock, some distance in the bedrock, on glacial till or on engineered fill. Footings founded on the surface of the bedrock below any weathered or broken rock may be designed for a bearing pressure at Ultimate Limit State (ULS) of ULS of 500 to 1500 KPa. Footing founded some distance in the bedrock such the nine-storey building may be designed for a bearing pressure at ULS of 2500 to 3500 KPa depending on the underside of footings elevations. Footings designed to bear on the compact silty sand /glacial till or on well-prepared engineered fill pad may be designed for a bearing pressure SLS of 150 kPa and factored geotechnical resistance ULS of 225 kPa. The factored ULS value includes a geotechnical resistance factor of 0.5. The available SLS/ULS bearing pressures for each structure will be further finalized by EXP once the final underside of footings are established and in consultation with the design team.

The basement and garage floor slabs of the proposed structures may be constructed as slabs-on-grade set on a bed of 300 mm of clear stone set over bedrock or engineered fill. Perimeter drainage as well as underfloor system will be required for the proposed structures However, these requirements per type of structure proposed at the site will have to be established/refined as part of the grades for the site as well, number of basement levels for each of the proposed building.

Excavations in the overburden at the site may be undertaken as open cut provided they are cut back at a slope of 1H to 1V above the groundwater table and at slope of 2H:to 1V to 3H:1V below the groundwater table. Excavation of the bedrock would require the use of line drilling and blasting technique and may be undertaken with near vertical sides. Vibrations should be monitored during construction to prevent damage to adjacent structures and services especially along the high pressure watermain fronting the development along Hazeldean Road. A pre-condition survey of all the structures and services situated within proximity of the site will be required prior to commencement of construction and during the excavation of the bedrock. Seepage of surface and sub-surface water into the excavations should be anticipated, however it should be possible to collect the water entering the excavation in perimeter ditches and to remove it by pumping from sumps. The needs for high-capacity pumps should not be overlooked.

The subject site has been classified as **Class C** for seismic site response in relation to Section 4.1.8.4 of the 2012 Ontario Building Code (OBC 2012) provided that the foundations are placed on engineering fill pads or on glacial till with more than 3 m of soils exist between the underside of footings and bedrock surface. A **Class A** seismic site class can be used for footings placed directly on bedrock or in areas where the depth of overburden between the underside of footings and bedrock is less than 3 m.

The pavement structure for the parking areas, subdivision roadways and roadways to be used by bus traffic are presented in Table IX of the report.

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

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Appendix

1 Introduction

EXP Services Inc. (EXP) completed a geotechnical investigation for the proposed residential development to be located at the site registered by the street address of 6171 Hazeldean Road in the City of Ottawa, Ontario (Figure No. 1). This work was authorized by Mr. Carmine Zayoun on behalf of 11654128 Canada Inc.

Latest project plans call for the development of the site with the following residential products;

- One nine-storey, multi use building with one or more underground parking – Totalling 175 units- Proposed Underside of footing (USF)=113.08
- Five residential four storey each condominium buildings (Block A to E), each of 35 unit and with one underground parking level; USF= 117.6 to 116.0 m
- Twenty (20) single homes with one basement level each; and Twenty townhome blocks of two (2) to eight (8) units each with one basement level; USF varying between 119.62 and to 115.5 m.
- Two amenity park buildings; and
- One storm management Pond with bottom elevation at 113.70 m

Underground services, subdivision roadways, will be also constructed as part of the facility.

Latest grading plan for the site indicates that the proposed grades along the roadways would range from 122.22 m to 120.10 m along the west end of the site and from 118.0 m to 118.6 m along the east end of the site A grade raise of up to 3 m is proposed for the site as the results of the proposed development.

The geotechnical investigation was undertaken to:

- Establish the subsurface soil/bedrock and groundwater conditions at the borehole and test pit locations;
- Classify the site for Seismic Site Response in accordance the requirements of the 2012 Ontario Building Code (OBC), and comment on the liquefaction potential of the subsurface soils;
- Establish the grade-raise restrictions at the site;
- Make recommendations regarding the most suitable type of foundations, founding depth, Serviceability Limit State (SLS) bearing pressure and Ultimate Limit State (ULS) factored geotechnical resistance of the founding strata for the various residential buildings proposed for the site;
- Discuss slab-on-grade construction and permanent drainage requirements foreach of the proposed building type;
- Discuss excavations and dewatering requirements during construction;
- Comment on backfilling requirements and suitability of on-site soils for backfilling purposes; and
- Recommend pavement structures for the proposed subdivision roadways.

The comments and recommendations given in this report assume that the above-described design concept will proceed to 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 Background Information

A geotechnical report prepared for the subject site by Paterson Group (Paterson), under Report PG4917-1 dated May 23, 2019 was provided to EXP as reference material. The report was prepared for Kavanagh Family Investments Ltd.

A series of test pits and boreholes were excavated/drilled by Paterson as part of the investigation as well as previous investigated distributed throughout the site. The report indicates that the elevation of the bedrock at the location of test pits/borehole ranged between to Elevation 117.93 m to lower than 113.6 m Paterson has also identified an area of peat and marl in the southern area of the site as well as fill in all the test holes. Infiltration of groundwater was recorded in some of the test pits at depths ranging between 2.5 m and 3.0 m below ground surface Logs of test pits/boreholes excavated by Paterson are attached in Appendix A.

Test pits excavated by Paterson group as well as bedrock data recorded at each location are presented in Figure 2. Relying on this data will be the sole responsibility of the user. The user must refer to the original report for the locations of test pits and boreholes as well as the subsurface conditions recorded.

3 Site Description

The subject is registered by the street address of 6171 Hazeldean Road, near the intersection of Carp Road, in Ottawa (Stittsville), Ontario. The property is legally described as Concession 12, Part of Lot 23, Parts 2, 4, and 6 of Registered Plan No. 4R-23045.

The property is currently unoccupied and covered by grass with some granular and asphaltic concrete patches. Sparse vegetation covers the western half of the subject site, with lightly wooded area occupying the western corner of the site. The property is bounded by Hazeldean Road to the southeastern side and by residential developments from all other sides.

Ground surface elevations at the site slopes in the easterly direction. Topographical survey prepared for the site should be referred for a more detailed information regarding the site grades and topography

Latest grading plans prepared by EXP Services Inc. as Drawing GPM Project OTT-00258780-A0 dated April 27, 2021 indicates the proposed site grades along the roadway will vary form Elevation 122.00 m to Elevation 120.20 m along the west end of the site and from 118.0 m to 118.6 m along the east end of the site. A grade raise of up to 3 m is proposed for the site as the results of the proposed development with some areas which will be in cut.

4 Procedure

The fieldwork for the geotechnical investigations was completed in three stages, i.e. between March 17 and March 24, 2020, between November 25 and December 9, 2020 and on February 23, 2021 and comprised the drilling of sixteen (16) boreholes (Borehole Nos. 1 to 16) using a CME-55 track mounted drill rig and the excavation of thirty-six (36) test pits (Test Pit Nos. 1 to 36) using a 320 excavator to termination depths ranging between 0.2 m to 10.8 m below the existing ground surface. The fieldwork was supervised on a full-time basis by a representative of EXP.

The locations and geodetic elevations of the boreholes and test pits were established in the field by representative of EXP as shown on Figure No. 2. Their locations were cleared from any underground services by USL-1 cable locators.

Standard penetration test samples were performed in the overburden in the boreholes at 0.75 m depth intervals and the soil samples retrieved by split-barrel sampler to refusal depth. Below the refusal depth, Borehole Nos. 1 to 3 and 7 to 13 were cased and advanced further using washboring and coring techniques with NQ-size core barrel to termination depths between 3.6 m to 10.8 m below the existing ground surface. During bedrock coring, a careful record of any sudden drops of the drill rods, colour of wash water and wash water return was kept. In the Test Pits, grab samples were collected from selected depths.

All the soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified. Similarly, the rock cores were logged, placed in core boxes and identified. On completion of the fieldwork, all the soil samples and rock cores were transported to the EXP laboratory in the City of Ottawa, Ontario where they were visually examined by a geotechnical engineer and borehole/test pits logs prepared. The engineer also assigned the laboratory testing, which consisted of performing natural moisture content on all soil samples and grain-size analysis tests on selected soil samples. In addition, unconfined compressive strength was completed on selected rock samples.

Water levels were measured in the open boreholes and test pits upon completion of drilling/excavation operations. In addition, 32 mm diameter monitoring wells and 19 mm diameter standpipes were installed in Borehole Nos. 1, 3, 5, 7, and 10 to 13 for long-term monitoring of the groundwater. The installation was completed in accordance with EXP standard practice and is documented on the respective borehole logs. The test pits were backfilled upon completion of the fieldwork.

5 Site and Soil Description

A detailed description of the geotechnical conditions encountered in the sixteen (16) boreholes and thirty (36) test pits are given on the borehole and test pit logs, Figure Nos. 3 to 54 inclusive. The borehole and test pit logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the location 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 and test pits were drilled to provide representation of subsurface conditions as part of a geotechnical exploration program and are not intended to provide evidence of potential environmental conditions.

A review of Figures Nos. 3 to 24 inclusive indicates that the lithology of the site consists of surficial topsoil or granular fill overlying a substantial deposit of fill material, which is underlain by native sand/silty sand, glacial till, or directly underlain by bedrock. Locally, deposits of marl/clay crust and peat are present underlying the fill material and overlying the native soils or bedrock.

5.1 Topsoil

A 50 mm to 250 mm thick layer of topsoil was encountered at the surface in Borehole Nos. 2, 6, 9 and 10 and at Test Pit Nos. 5, 11, 12, 13, 20 to 24, 27, 28, 30 to 34 and 36.

5.2 Fill Material

Heterogeneous fill material was encountered at all borehole and test pit locations and extended to depths ranging between 0.2 m to 2.9 m (Elevations 120.3 m to 114.2 m). The fill is generally heterogenous and variable and likely was deposited at the site over the years and from different sources and therefore other type and nature of fill may exist in areas not investigated by EXP. The fill comprised of a mixture of silty sand, silty gravelly sand, or gravelly sand with cobbles and boulders. Rootlets, wood pieces and bark fragments, and traces of other organic matter were detected within the fill material in some of the boreholes/test pits. Extensive and concentrated boulders were encountered within the fill at the locations of Test Pit Nos. 14, 17 and 18. In Test Pit Nos 11 and. 13, several large concrete blocks were present within the fill. The natural moisture content of the fill ranged between 3 to 30 percent, indicating moist to very moist conditions. It should be noted that the fill was likely deposited over the years and from different sources and therefore my have different matrix than recorded in other areas of the site. Therefore allowance must be made in the excavation contract in the event that unforeseen fill condition are encountered in some areas of the site which may require special handling and disposal. Previous reports indicated the presence of blast shattered rock fill in some areas of the site.

It is noted that hydrocarbon/organic odour was detected on the fill in TP-01, TP-02 and BH-15 which is likely localized to the type of fill imported to this area. Fill excavated from this area will need to be evaluated to established if it can remain on-site or dispose of site at a licenced facility.

Grain-size analysis performed on five (5) fill samples are presented on Figure Nos. 55 to 59 and summarized in Table V below.

Table I: Summary of Lab Test Results on Fill Samples					
Test Pit No.	Sample Depth (m)	Composition			Figure No.
		Gravel (%)	Sand (%)	Silt and Clay (%)	
BH-02	0.8 - 1.4	26	50	24	55
BH-03	0.8 - 1.4	51	39	10	56
BH-04	0 - 0.6	22	47	31	57
BH-09	0.8 – 2.1	29	45	26	58
TP 14	0 – 0.7	7	86	7	59

5.3 Peat/Marl/Clay Crust

Peat/marl complex deposit was encountered underlying the fill material in Borehole Nos. 2, 4, 5, 9 and 10 and in Test Pit Nos. 6 to 9, 12, 15, 22, 23, 24, 26 and 27 at depths ranging from 0.8 m to 2.3 (Elevations 118.5 m to 113.5 m) and extended to depths ranging from 1.4 m to 3.6 m (Elevations 118.5 m to 113.5 m). The approximate extent of the peat/marl organic deposit is shown on Figure 2. The peat/marl deposit extends to the surface of the bedrock in Test Pit Nos. 6, 9 and 12.

The organic peat/mark deposit is highly compressible and comprised of decomposed organic matter including wood fragments, bark pieces and rootlets fragments. The grey to grey-green calcareous marl is cohesive and often spongy in texture, indicating a high degree of saturation. A calcified tan to light brown clay crust was contacted between the peat and marl deposit in Test Pit No. 9. The natural moisture content of the peat/marl complex ranged between 22 to over 100 percent. Table II present the depths and elevations of the peat and marl in the test pits and boreholes by EXP.

Table II: Summary of Depth/Elevation of Peat/Marl in Test holes					
Test Hole	GS Elevation (m)	Peat Depth Interval		Peat Elevation	
		From (m)	To (m)	From (m)	To (m)
BH-2	119.1	1.4	3.6	117.7	115.5
BH-4	117.8	0.7	1.4	117.1	116.4
BH-5	116.5	2.3	3.0	114.2	113.5
BH-9	120.2	1.8	2.5	118.4	117.7
BH-10	118.4	1.0	2.2	117.4	115.7
TP-6	118.1	0.8	1.9	117.3	116.2 (Rock)
TP-7	117.6	1.3	1.5	116.3	116.1
TP-8	118.8	1.2	2.0	117.6	116.8

Table II: Summary of Depth/Elevation of Peat/Marl in Test holes (ctn'd)					
Test Hole	GS Elevation (m)	Peat Depth Interval		Peat Elevation	
		From (m)	To (m)	From (m)	To (m)
TP-9	118.8	1.2	3.1	117.6	115.7 (Rock)
TP-12	119.6	2.0	2.3	117.6	117.3 (Rock)
TP-15	120.2	1.4	1.7	118.8	118.5
TP-22	118.2	0.6	0.9	117.6	117.3
TP-23	118.2	0.9	1.2	117.3	117.0
TP-24	118.6	1.0	1.3	117.6	117.3
TP-26	118.7	1.2	2.7	117.5	116.0
TP-27	117.8	0.9	2.1	116.9	115.7

Additional information on the peat and marl can be found in the logs of test holes completed by Paterson group, attached in Appendix A.

5.4 Silty Sand

The organic peat in Borehole No. 5 is underlain by a deposit of silty sand with some gravel which extends to 5.3 m depth (Elevation 111.2 m). This deposit is compact as indicated by the SPT (N values) which ranged between 15 to 24 blows per 300 mm penetration of the split spoon sampler and has a natural moisture content ranging between 9 to 20 percent, indicating moist to very moist conditions. Grain-size analyses performed on one (1) sample from this deposit is presented on Figure No. 60 and summarized in Table III below.

Table III: Summary of Lab Test Results on Silty Sand Sample				
Test Pit No.	Sample Depth (m)	Composition		
		Gravel (%)	Sand (%)	Silt and Clay (%)
BH-05	3.8 - 4.4	1	56	43

5.5 Till

The peat/marl, fill and silty sand in in Borehole Nos. 2, 5, 6, 7, 8, 9, 12 and 14 and in Test Pit Nos. 7, 8, 15, 16, 18, 22 to 28 and 30 to 36 is underlain by glacial till which extends to termination depth or auger refusal depth, i.e., inferred surface of the bedrock contacted at 1.8 m to 6.2 m (Elevation 119.1 m to 110.3 m)

The glacial till is grey and comprised of silty sand with gravel to silty gravel with sand, and numerous cobbles and boulders. The glacial till is compact to very dense based on SPT (N values) which ranged from 16

blows to greater than 50 blows per 300 mm or less of penetration of the split spoon ampler. It has a natural moisture content ranging between 3 percent to 21 percent. Grain-size analysis performed on three (3) samples from this deposit is presented on Figure No 61 to 63 and summarized in Table IV below.

Table IV: Summary of Lab Test Results on Till Sample

Test Pit No.	Sample Depth (m)	Composition		
		Gravel (%)	Sand (%)	Silt and Clay (%)
BH-06	3.0 – 3.6	39	44	17
BH-07	1.5 – 2.1	39	50	11
BH-08	3.0 – 3.6	43	38	19

5.6 Auger/Backhoe Refusal

Refusal to augers or to excavator bucket advancement was encountered in all test holes except for Borehole No. 14 and Test Pit Nos. 26, 27, 32 and 36 at depths ranging between 0.2 and 6.2 m below the existing ground surface (Elevation 119.1 m to 114.3 m). The inferred depth and elevation of the bedrock at the location of the test holes is summarized in Table V.

Table V: Summary of Bedrock Depth and Elevation in Boreholes and Test Pits

Borehole or Test Pit No.	Ground Surface Elevation (m)	Bedrock Depth (m)	Bedrock Elevation (m)
BH-01	117.1	0.7	116.4
BH-02	119.1	3.8	115.3
BH-03	120.4	3.5	117.0
BH-04	117.8	1.8	116.0
BH-05	116.5	6.2	110.3
BH-06	120.5	3.6	116.9
BH-07	120.9	5.8	115.1
BH-08	120.2	3.2	117.0
BH-09	120.2	4.0	116.2
BH-10	118.4	3.5	114.9
BH-11	117.9	0.9	117.0
BH-12	117.1	0.4	116.7
BH-13	116.3	0.3	116.0
BH-15	116.2	1.4	114.8

Table V: Summary of Bedrock Depth and Elevation in Boreholes and Test Pits			
Borehole or Test Pit No.	**Ground Surface Elevation (m)**	**Bedrock Depth (m)**	**Bedrock Elevation (m)**
BH-16	116.2	0.2	116.0
TP-01	116.1	1.8	114.3
TP-02	116.6	0.3	116.3
TP-03	116.2	0.6	115.6
TP-04	117.2	0.5	116.7
TP-05	117.6	0.3	117.3
TP-06	118.1	1.9	116.2
TP-07	117.6	2.3	115.3
TP-08	118.8	2.5	116.3
TP-09	118.8	3.1	115.7
TP-10	118.7	2.3	116.4
TP-11	119.2	1.4	117.8
TP-12	119.6	2.3	117.3
TP-13	119.4	2.9	116.5
TP-14	120.1	2.3	117.8
TP-15	120.2	2.2	118.0
TP-16	119.9	1.8	118.1
TP-17	120.5	4.2	116.3
TP-18	120.8	3.7	117.1
TP-19	117.1	0.9	116.2
TP-20	117.0	0.4	116.6
TP-21	117.7	0.5	117.2
TP-22	118.2	1.5	116.7
TP-23	118.2	3.0	115.2
TP-24	118.6	2.0	116.6
TP-25	118.6	2.3	116.3
TP-28	119.4	2.5	116.9
TP-29	119.1	0.6	118.5
TP-30	119.2	2.0	117.2
TP-31	119.8	2.7	117.1
TP-33	120.5	1.8 - 2.7	118.7-117.8
TP-34	120.3	1.2	119.1
TP-35	120.4	1.8- 2.4	118.6-118.0

Washboring and core drilling techniques were used to advance beyond the refusal depth in Borehole Nos. 1 to 3 and 7 to 13 revealed that refusal was met on bedrock. A review of the recovered rock cores and geological maps revealed that the bedrock underlying the site is limestone bedrock of the Bobcaygeon Formation.

A Total Core Recovery (TCR) and Rock Quality Designation (RQD) of 61 to 100 percent and 0 to 100 percent respectively were obtained when core drilling the bedrock. On this basis, the bedrock quality within the depth investigated may be classified as very poor to excellent.

A total of fifteen (15) rock samples were selected for unconfined compressive strength testing and the test results are presented in Table VI. A review of the test results indicates a strong to very strong bedrock with compressive strength ranging between 91 MPa and 188 MPa (Canadian Foundation Engineering Manual, 4th edition, 2006). The unit weight of the bedrock ranged between 2643 kg/m^3 and 2695 kg/m^3.

Table VI: Results of Unconfined Compression Tests on Rock Samples

Borehole No./RUN No.	Depth (m)	Compressive Strength (MPa)	Unit Weight of Bedrock (kg/m^3)
BH 1 – Run 1	0.9 – 1.0	153	2668
BH 1 – Run 2	2.2 – 2.3	176	2680
BH 1 – Run 3	3.1 – 3.3	124	2668
BH 2 – Run 1	3.8 – 4.0	174	2673
BH 2 – Run 2	5.6 – 5.7	182	2678
BH 3 – Run 1	2.0 – 2.2	168	2695
BH 3 – Run 3	3.6 – 3.7	127	2650
BH 3 – Run 3	4.4 – 4.5	160	2695
BH 7 – Run 2	6.4 – 6.6	122	2653
BH 7 – Run 4	10.4 – 10.6	128	2660
BH 8 – Run 2	5.4 – 5.6	188	2661
BH 8 – Run 4	8.6 – 8.8	145	2667
BH-9 – Run 2	5.4 – 5.6	199	2677
BH 10 – Run 1	4.1 – 4.3	137	2661
BH 11 – Run 3	3.5 – 3.7	91	2643

Photographs of the recovered bedrock cores are presented on Figures Nos. 64 to 73.

5.7 Groundwater Level

Water level observations were made in the open boreholes and test pits upon completion of the field work and subsequently in monitoring wells installed in Borehole Nos. 1, 3, 5, 7, 10, 12 and 13. A summary of the observations made are presented in Table I.

Table I: Summary of Groundwater Measurements in Boreholes/Test Pits

Monitoring Well ID	Ground Elevation (m)	Date of Last Reading	Depth to Water (m)	Elevation of Groundwater (m)
BH-01	117.1	May 14, 2020	1.20	115.90
		July 2, 2020	2.02	115.08
		January 25, 2021	1.24	115.86
		March 1, 2021	1.57	115.53
BH-03	120.4	May 14, 2020	1.60	118.80
		July 2, 2020	2.11	118.29
		January 25, 2021	2.03	117.51
		March 1, 2021	N/A	N/A
BH-05	116.5	May 14, 2020	2.60	113.90
		July 2, 2020	2.75	113.75
		January 25, 2021	2.75	113.75
		March 1, 2021	2.89	113.61
BH-07	120.9	January 25, 2021	3.38	117.52
		March 1, 2021	3.59	117.31
BH-10	118.4	January 25, 2021	2.12	116.28
		March 1, 2021	2.08	116.32
BH-12	117.1	March 1, 2021	1.48	115.62
BH-13	116.3	March 1, 2021	1.34	115.76

A review of Table I indicates the groundwater table in the boreholes to be at depths 1.20 m to 3.59 m below grade, i.e., Elevation 118.77 m to 113.61 m.

Water levels observations were made in the exploratory boreholes at the times and under the conditions stated in the scope of services. These data were reviewed and EXP's interpretation of them discussed in the text of the report. Note that fluctuations in the level of the groundwater may occur due to 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.

6 Grade Raise

The investigation has revealed that the site to be underlain by heterogenous fill deposit overlain by silty sand to silty sand and gravel and glacial till and limestone bedrock contacted at depths of ranging between 0.2 and 6.2 m below the existing ground surface (Elevation 118.1 m to 110.3 m). As part of the site preparation, all fill, peat and marl will be removed from the envelope of the proposed buildings and roadways and replaced with engineered fill.

Latest grading plan prepared for the site by EXP under Project OTT-00258780-A0, Drawing GPM and dated April 27, 2021 indicates that the grades at the site will be raised by up to 3 m whereas some areas will be in cut. This grade raise is considered feasible at the site from a geotechnical point of view.

7 Site Preparation/Site Grading

Site grading within the footprint of the proposed buildings and roadways should consist of the removal of fill, peat and marl to the surface of bedrock or native soil whichever occurs first. Under the roadways, it may be possible to leave some of the fill in place, if it is not underlain by any peat/marl and pending further evaluation and treatment on-site during construction. It also may be possible to leave the organic soils in the area of the proposed park.

The following recommendation are provided for the site development preparation:

- All fill, peat and organic material must be removed from the envelope of the proposed buildings, roadways box, underground services etc. to the surface of native soils or bedrock whichever occurs first, and the areas should be reviewed by a geotechnical engineer. In areas where the exposed approved surface of native soils or bedrock is below the proposed underside of footings, OPSS Granular B Type II should be placed in 300 mm lifts and each lift compacted to 100 percent and 98 percent of the Standard Maximum Proctor Dry density (SPMDD) in accordance with ASTM D698-12e2 for underside of footings to be founded on engineered fill or bedrock and services respectively.
- Along the roadways and following the removal of all the peat/organic and fill to subgrade level, the subgrade should be proofrolled using a 10 ton vibratory roller in the presence of a geotechnician. Any soft areas detected should be sub-excavated and replaced with imported material (as per Section 14) or by on-site approved material which is free of organic, boulders or cobbles; Approved subgrade fill should be placed in 300 mm lifts and each lift compacted to 98 % of SPMDD.
- The removal of unsuitable material should extend a sufficient distance beyond the perimeter of the structure/roadway box to accommodate a 1.0 m wide bench of engineered fill, which is thereafter sloped at an inclination of 1H:1V down to the native soil/bedrock.
- The engineered fill should be placed under the full-time supervision of a geotechnician working under the direction of a geotechnical engineer. In-place density tests should be undertaken on each lift of the engineered fill to ensure that it is properly compacted prior to placement of the subsequent lift.
- Management of the excess fill material should be done as per the recommendation of the Phase II Environmental Site Assessment report prepared by EXP for this site under a sperate report.

8 Foundation Considerations

The investigation has revealed the site to be underlain by heterogenous fill extending to depths of 0.2 m to 2.9 m below grade and by marl and peat and glacial till. The overburden is underlain by bedrock contacted at depths of 0.2 and 6.2 m below grade. The fill, peat and marl are not suitable as founding medium for the proposed residential development (building and roadways) and must be removed and replaced with engineered fill or footings placed on top of the limestone bedrock or the surface of the glacial till and silty sand contacted at localized areas throughout the site as described in Section 7 of the report.

Table VIII present the anticipated founding medium for each of the proposed buildings based on the information available to date.

Table VIII: Summary of Anticipated Founding Medium For Each type of Structure

Building	Anticipated Founding Medium
Nine-storey, multi use building with one or more underground parking	Limestone Bedrock= USF = 113.08 m
Block A to E	Limestone Bedrock or Engineered Fill on Top of Bedrock- USF 117.28 m to 117.60 m
Townhouse blocks	Limestone Bedrock/Engineered Fill or Glacial Till USF = 119.62 to 115.50 m

The underside of footings noted above are as per latest grading plan prepared by EXP and may be updated/revised as part of the final design therefore various founding medium may be the case at the site and each scenario discussed .below

8.1 Footings Directly on Bedrock

Footings designed to bear on the surface or in the upper levels bedrock below any weathered or fractured zones such as the case for the low residential single, townhouses and four storey condominium building may be designed for a bearing pressure at a factored geotechnical resistance ULS of 500 to 1500 KPa. Footing founded some distance in the bedrock such the case of the nine-storey building may be designed for a bearing pressure at ULS of 2500 to 3500 KPa depending on the underside of footings elevations. The available SLS/ULS bearing pressures for each structure will be further finalized by EXP once the final underside of footings are established and in consultation with the design team.

The surface of the exposed bedrock at the underside of the footings should be examined by a geotechnical engineer and any fractured bedrock zones or fissured removed/cleaned prior to casting of the footings. Filling of the cleaned fissures with concrete and addition of rebar across any large fissures may be required and can be best established in the field by qualified geotechnical engineers or senior technicians.

Settlement of the footings designed for the ULS bearing pressure recommended above and properly constructed are expected to minimal.

8.2 Footings on Engineered Fill Pad, On Silty Sand or on Glacial Till

As indicated above, all fill, peat and marl should be removed from the envelope of the proposed buildings and replaced with engineered fill as indicated in Section 7.0 of the report.

Footings designed to bear on the native soils or on the well-prepared engineered fill pad may be designed for a bearing pressure SLS of 150 kPa and factored geotechnical resistance ULS of 225 kPa. The factored ULS value includes a geotechnical resistance factor of 0.5. The SLS value recommended assumes a maximum grade raise at the site of up to 2.0 m.

Settlement of the footings designed for the SLS bearing pressure recommended above and properly constructed are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential.

8.3 General Recommendation

Footings should not be founded partly on engineered fill/native soils and partly on bedrock. In such cases, additional reinforcement should be provided to the footings and foundations in areas where the founding medium changes from bedrock to engineered fill. In addition, a transition zone treatment may be required in areas where the subgrade changes from overburden to bedrock and vice versa.

A minimum of 1.5 and 1.0 m of earth cover should be provided to the footings of a heated structure founded on engineered fill/native soil and on bedrock respectively. The frost cover should be increased to 2.1 and 1.5 m for unheated structures respectively.

All footing subgrades and beds should be examined by a geotechnical engineer to ensure that the founding surfaces can support the design bearing pressure and that the footing beds have been properly prepared as described above. In areas of glacial till, a 50 mm mud slab is recommended to be placed on the surface of the approved subgrade to minimize disturbance.

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

9 Floor Slabs and Drainage Requirements

The lowest basement of the nine-storey building, residential blocks and two-storey townhouse blocks may be constructed as slab-on-grade provided they are set on beds of well compacted 19 mm clear stone at least 200 mm thick placed on bedrock or on well compacted engineered fill. The clear stone would prevent the capillary rise of moisture to the floor slab. Adequate saw cuts should be provided in the floor slab to control cracking.

It is anticipated that perimeter drains would be required for the proposed residential blocks with basement. The perimeter drains may consist of 100 mm diameter perforated pipe wrapped with filter cloth (sock) and set on the footings and surrounded with 150 mm of 19 mm clear stone and properly outletted. The subsurface walls should be adequately waterproofed.

Underfloor drainage system will likely be required for some of the townhouse blocks, the nine-storey building and or the residential blocks with more than one level of underground parking. These requirements will be best established once the design has been finalized and underside of footings, number of underground parking levels established for each of the high-rise buildings as well as the residential townhouse blocks.

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

10 Pipe Bedding Requirement

It is recommended that the bedding for the underground services including material specification, thickness of cover material and compaction requirements conform to the local requirements of the municipality and/or Ontario provincial Standard Specification and Drawings (OPSS and OPSD).

For guidance, the pipe bedding may consist of 300 mm and 150 mm of OPSS 1010 Granular A for services founded on native soils/engineered fill and bedrock respectively. The bedding material should be also placed along the sides and on top of the pipes to provide a minimum cover of 300 mm. The bedding, spring line and cover should be compacted to at least 98 percent the Standard Proctor Maximum Dry Density (SPMDD).

Where the subgrade changes from bedrock to native soil, a transition zone must be provided to minimize the concentration of stresses along the change in the founding medium.

11 Lateral Earth Pressure against Basement Walls

The subsurface walls should be backfilled with free draining material, such as OPSS 1010 for Granular B, Type II and equipped with a perimeter drainage system to prevent the buildup of hydrostatic pressure behind the walls. The walls will be subjected to lateral static and dynamic (seismic) earth forces.

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

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

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

K_0 = lateral earth pressure coefficient for 'at rest' condition for Granular B Type II backfill material = 0.5

γ = unit weight of free draining granular backfill; Granular B = 22 kN/m^3

H = Height of backfill adjacent to foundation wall, m

q = surcharge load, kPa

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

$$\Delta P_E = 0.32 \gamma H^2$$

where ΔP_E = resultant thrust due to seismic activity; kN/m

γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m^3

H = height of backfill behind wall, (m)

The ΔPE value does not take into account the surcharge load. The resultant load should be assumed to act at 0.63 H from the bottom of the wall.

The requirement of damproofing/waterproofing of the foundation walls of the various structures proposed for the site must be established once the design grades at the site have been finalized.

12 Excavations

Excavations for the construction of the residential blocks and underground services will be extended through the fill, native soils and into the bedrock in some areas of the site and will be below the groundwater table in some areas throughout the site. Excavation for the nine storey building will require extensive removal of the bedrock. Excavation will be below the groundwater table in some areas of the site.

Excavations at the site must comply with the latest version of Ontario Occupational Health and Safety Act, Ontario Regulations 213/91 (January 11, 2014), i.e. excavation in the overburden should be cut back at a slope of 1H to 1V above the groundwater table. Below the groundwater table, the excavations sides are expected to slough and will eventually stabilize at a slope of 2H:1V to 3H:1V. If space restriction prevents the provision of the above slopes, the excavation may be undertaken within the confines of a prefabricated support system, such as a trench box which is designed and installed in accordance with the requirement of OHSA 213/91. In the vicinity of Borehole No. 5, any excavation below the groundwater table in the silty sand will require additional pumping.

Excavation of the bedrock may be undertaken with near vertical sides and would require the use of line drilling and blasting techniques. To prevent any damage to the surrounding structures and services, the blasting operations would have to be carefully planned and closely monitored. It is recommended that the blasting contractor should retain the services of a blast specialist to provide him with a blasting plan. The contractor should have a licensed blaster on site always during the blasting and a vibration engineer on retainer. A condition survey of all the structures near the site should be undertaken prior to commencement of the excavation work. Vibration monitoring should be carried out during blasting operations. Vibrations should be monitored at property boundaries and should be limited so that there will be no damage to the existing structures or services. In addition, vibration monitoring should be completed along the high pressure watermain situated along the hazeldean road. Further coordination with the City of Ottawa will eb required for this purpose.

Water inflow into the excavation should be expected. However, it should be possible to adequately handle this inflow by collecting the water in perimeter ditches and pumping from properly filtered sumps. It is possible that additional localized sumps may be required in areas where the seepage is more extensive.

12.1 Dewatering Requirement

Seepage of the surface and subsurface water into the excavations is anticipated. Should such seepage occur, it should be possible to collect water entering the excavation in perimeter ditches and to remove it by pumping from sumps located at low points. In areas of high infiltration or in areas where more permeable layers may exist in the till, a higher seepage should be anticipated. Therefore, the need of high capacity pumps to keep the excavation dry should not be overlooked.

It is anticipated the civil work as well excavation for the residential development would necessitate groundwater removal from the site. It is noteworthy to mention that new legislation came into force in Ontario on March 29, 2016 to regulate groundwater takings for construction dewatering purposes. Prior to March 29, 2016, a Category 2 Permit to Take Water (PTTW) was required from the Ontario Ministry of the Environment and Climate Change (MOECC) for groundwater takings related to construction dewatering, where taking volumes were in excess of 50 m^3/day, but less than 400 m^3/day, and the taking duration was

no more than 30 consecutive days. The new legislation replaces the Category 2 PTTW for construction dewatering with a new process under the Environmental Activity and Sector Registry (EASR). The EASR is an on-line registry, which allows persons engaged in prescribed activities, such as water takings, to register with the MOECC instead of applying for a PTTW.

To be eligible for the new EASR process, the construction dewatering taking must be less than 400 m^3/day under normal conditions. The water taking can be groundwater, storm water, or a combination of both. It should be noted that the 30-consecutive day limit on the water taking under the old Category 2 PTTW process has been removed in the new EASR process. Also, it should be noted that the EASR process requires two technical studies be prepared by a Qualified Person, prior to any water taking. These studies include a Water Taking Report, which provides assurance that the taking will not cause any unacceptable impacts, and a Discharge Plan, which provides assurance that the discharge will not result in any adverse impacts to the environment. A significant advantage of the new EASR process over the former Category 2 PTTW process, is that the groundwater taking may begin immediately after completing the on-line registration of the taking and paying the applicable fee, assuming the accompanying technical studies have been completed. The former PTTW process typically took more than 90 days, which had the potential to impact construction schedules.

Although this investigation has estimated the groundwater levels at the time of the fieldwork, and commented on dewatering and general construction problems, conditions may be present, which are difficult to establish from standard boring 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.

13 Seismic Site Classification

The investigation has revealed that the proposed residential buildings proposed for the site will be founded either on engineered fill pad, glacial till or on bedrock and that all the fill and organic material will be removed and replaced with well prepared and compacted engineered fill.

The results of the MASW survey are documented in Appendix B. The results of the MASW survey indicates that the overall shear wave velocity V_{S30} for the site from ground surface to a 30 m depth below ground surface is 1262.5 m/s, which corresponds to a site Class B for seismic site response as per Table 4.1.8.4.A of the 2012 Ontario Building Code (OBC). However, in accordance with the OBC, site class B as well as site class A can only be used if there is less than 3 m of soil from below the underside of the footing (USF) to the top of the bedrock. If there is more than a 3 m thick layer of soil from the underside of the footing to the top of the bedrock, the site class for seismic site response is site class C. In the case where there would be 2.0 m or less of soil between the overburden and the bottom of the foundation, the minimal V_{S30} value would be greater than 1500 m/s, allowing the use of site class A.

Therefore, the classification at the site for seismic site response is summarized as follows:

- Class C if the distance between the USF of the proposed buildings and the top bedrock is greater than 3.0 m.
- Class B if the distance between the USF of the proposed buildings and the top bedrock is between 2.0 m and 3.0 m.
- Class A if the distance between the USF of the proposed buildings and the top bedrock is less than 2.0 m.

Based on the results of the investigation, there is no liquefaction potential of the subsurface soil during a seismic event given that loose and soft areas will be sub-excavated and replaced with engineering fill during construction from under the foundations and services.

14 Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The material to be excavated from the site will comprise of excessive amount of heterogenous fill containing boulders, cobbles, peat and marl, wood fragments, construction debris, etc. native soils and bedrock.

The following recommendation are provided with respect to the re-use of the on-site excavated soils as backfill and subgrade fil as well as requirement for backfilling;

- Topsoil, peat and marl are not suitable for use as backfill and must be removed and disposed of site,
- The heterogenous fill is not suitable for use as subgrade fill or as fill against the foundation wall in its present state. Select fill material free of organics, boulders and cobbles may be used as subgrade fill in the landscaped area, i.e. in areas where some settlement is not of a concern Select on-site fill, free of organics, debris , boulders and cobbles may be used as subgrade material in the lower levels under the roadways provided it is reviewed on-site by a geotechnician and is placed and compacted in 300 mm lifts using 10 vibratory roller. Prior to the re-use of the on-site fill, all boulders, debris and organic must be removed from it. It should be noted that the amount of material available for this purpose, cannot be quantified due to its high variability and its heterogenous nature which was likely deposited at the site over the years and from different sources. Contractor bidding on this project should review the available data and decide on their own whether or not some of the on-site fill can be used for this purpose;
- Blast shattered bedrock excavated from the site with maximum size of 400 mm and containing sufficient fines to fill any voids may be used as subgrade fill in the lower levels to raise the grades under the roadways provided it is placed in 500 mm lifts and each lift compacted with a 10 tons vibratory roller under the supervision of a geotechnican. Blending of the blast/shattered rock with finer material such as OPSS 1010 Granular A may be required to fill any void within the rock matrix;
- Crushing of the excavated bedrock on-site for use as OPSS 1010 Granular B type II can be considered as an option by the contractor undertaking this work if considered feasible from an economic point of view; and
- Management of excess soils generated from the site should be undertaken as per the recommendation provided in the Phase II ESA report prepared for the site by EXP.

It is anticipated that most of the material required for backfilling purposes and subgrade fill will need to be imported and should preferably conform to the following specifications:

- Engineering fill under footing and basement floor– OPSS 1010 Granular B Type II placed in 300 mm thick lifts and compacted to 100 percent of the SPMDD under footings and to 100 percent of the SPMDD under the basement floors;
- Backfilling against exterior basement walls – OPSS 1010 Granular B Type I or II, placed in 300 mm thick lifts and compacted to 95 percent of the SPMDD;

- Trench backfill and fill placement to subgrade level for pavement – OPSS 1010 Select Subgrade Material (SSM), free of organics, debris and with a natural moisture content within 2 percent of the optimum moisture content. It should be placed in 300 mm thick lifts compacted to minimum 95 percent of the SPMDD.

15 Subdivision Road and Parking Area

The subgrade under roadways is expected to engineered fill prepared as per the recommendation o f this report. Pavement structure thicknesses required for the subdivision streets and driveways were computed and are shown on Table IX. The thicknesses are based upon an estimate of the subgrade soil properties determined from visual examination, textural classification of the soil samples and functional design life of 18 to 20 years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table IX: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Pathway-Parkland	Cars Only	Subdivision Roadways	Bus Traffic
Asphaltic Concrete (PG 58-34)	92 to 97% MRD	50 mm HL3F	65 mm HL3/SP12.5	40 mm SP12.5/HL3 50 mm SP19/HL8	50 mm SP12.5/HL3 70 mm SP19/HL8
Granular A Base (crushed limestone)	100% SPMDD*	300	150 mm	150 mm	150 mm
Granular B Sub-base, Type II	100% SPMDD*	-	300 mm	400 mm	500 mm

SPMDD* Standard Proctor Maximum Dry Density, ASTM-D698
MRD denotes Maximum Relative Density, ASTM D2041
Asphaltic Concrete in accordance with OPSS 1150/ 1151- Category B is recommended

Additional comments on the construction of parking area are as follows:

1. As part of the subgrade preparation for the areas to be paved, the subdivision roadways should be stripped of topsoil, fill, marl as described in Section 7 of the report and any unsuitable material down to subgrade level. The exposed area should be proof rolled with a 10 tons vibratory roller. Any soft areas detected should be sub-excavated and replaced with approved imported material conforming to OPSS 1010 for Select subgrade Material (SSM) or with on-site approved fill which should be placed in 300 mm lifts and each lift compacted to 95 percent of the SPMDD.
2. The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. As a minimum, subdrains stubs should be installed between catchbasin and at low points. This will ensure no water collects in the granular course, which could result in pavement failure during the spring thaw. The location and extent of sub drainage required within the paved areas should be reviewed by this office in conjunction with the proposed site grading.
3. To minimize the problems of differential movement between the pavement and catch basins/manhole due to frost action, the backfill around the structures should consist of free-draining granular preferably conforming to OPSS Granular B, Type II material. Weep holes should be

provided in the catch basins/manholes to facilitate drainage of any water that may accumulate in the granular fill.

4. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavorable weather.
5. 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 catch basins. Surface water should not be allowed to pond adjacent to the outside edges of paved areas.
6. Relatively weaker subgrade may develop over service trenches at subgrade level if wet soils is used to backfill of the service trenches. Therefore, only dry and compactible material should be used to backfill service trenches as recommended in Section 7 of the report.
7. 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 D698-12 e2). The asphaltic concrete used, and its placement should meet OPSS 1150/1151 and 310/313 requirements. It should be compacted to 92 to 97 percent of the maximum relative density in accordance with ASTM D2041.

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

16 Subsurface Concrete Requirement

Chemical tests limited to pH, sulphate and resistivity were undertaken on three (3) selected soil samples and the results are shown in Table VI. The laboratory certificate of analysis for the chemical tests is shown in Appendix C.

Table X: Results of pH, Chloride, Sulphate and Resistivity Tests on Selected Soil and Bedrock Samples

Borehole No. - Sample No.	Soil / Rock	Depth (m)	pH	Sulphate (%)	Resistivity (mS/cm)
BH 7 – SS3	Glacial Till	1.5 – 2.1	8.11	0.0038	5465
BH 8 – SS4	Glacial Till	2.3 – 2.9	8.03	0.0047	5319
BH 9 – SS2	Fill	0.8 – 1.4	7.71	0.0103	3021

The results indicate the soils have a negligible sulphate attack on subsurface concrete. The concrete should be designed in accordance with CSA A.23.1-14.

The results of the resistivity tests indicate that the soil at the site is moderately corrosive to mildly corrosive to bare steel as per the National Association of Corrosion Engineers (NACE). Appropriate measures should be undertaken to protect the buried bare steel from corrosion.

17 Tree Planting

Clayey soils were not encountered at the site and therefore there is no restriction on tree planting from a geotechnical point of view.

18 Storm Management Pond

A storm management pond is proposed towards the south east corner of the site. Three boreholes and one test pit drilled/excavated in the vicinity of the proposed pond, i.e. Borehole Nos. 1, 12 and 13 and Test Pit 3 revealed the subsurface condition to comprise of a shallow deposit of overburden underlain by limestone bedrock contacted at Elevation 115.6 m to 116.7 m. The groundwater measurements taken at these locations ranged between 1.3 m to 1.5 m below grade, i.e. Elevation 115.6 m to 115.0 m.

The stormwater management pond is proposed with a bottom elevation at elevation 113.70 and 3H:1V side slopes to 116.10m. The 1:100 year elevation is 115.75 m and emergency spill elevation is set at 115.90 m. Six rows of 150mm diameter subdrains are proposed beneath the pond bottom, at roughly 6 metres on centre at elevations 113.1 to 113.0, sloping towards the outlet manhole. No infiltration is proposed beneath the dry pond, as the pond will be located within the limestone bedrock.

The Macro Grading Plan, GPM rev. 2, dated April 27, 2021, was reviewed with respect to the underside of footing elevation for both the proposed and adjacent residential units. The expected minimum underside of footing elevation within the proposed development is 115.90m, or 2.2m above the pond bottom. The underside of footing elevations within the adjacent residential units on Bandelier Way are 113.90m to 113.78m. The weeping tiles around the perimeter of the footings drain to the storm sewer system. The stormwater pond bottom was set at a similar elevation 113.70m vs 113.78m, as the adjacent underside of footing elevations on Bandelier Way that were obtained from drawings provided by the City.

The stormwater runoff from development will outlet through a 1,050mm diameter storm sewer, located within the walkway block, then flow east along Bandelier Way. On May 6, 2021 the stormwater flow in manhole MHST78509 (invert=111.70m) on Bandelier Way and MHST78510 (invert=111.35m) were observed, with no notable groundwater flow (refer to photos MHST78509, May 6, 2021 and MH78510, May 6, 21). Within this 68m length of storm sewer there are approximately 18 homes fronting Bandelier Way, with 45 homes upstream to the high point in the storm sewer system on Bandelier Way. The weeping tiles around the perimeter of the footings drain to the storm sewer system. This section of storm sewer, that was installed within the limestone bedrock, is approximately 2.0m to 2.3m below the proposed stormwater pond bottom elevation and 1.3m to 1.6m below the proposed subdrain elevations for the stormwater pond. The sanitary sewer along this section of Bandelier Way is 0.8m to 1.0m lower than the storm sewer or roughly 3.0m below the proposed pond bottom. It is expected that the blasted trenches for storm and sanitary sewers have lowered the ground water table, as there was no notable flow from the weeping tiles connect to the storm sewer system, from the May 6, 2021 field review. We expect that once blasted trenches for the sanitary and storm sewer are completed that the groundwater table will be lowered within the site and the vicinity of the proposed dry pond (Appendix D).

From a geotechnical point of view, there are no concerns regarding the proposed pond and its design and there is expected to be minimal groundwater flow, beneath the pond bottom once constructed. A subdrain system is proposed beneath the stormwater pond to aid in draining the dry pond after rainfall events.

19 General Comments

The comments given in this report are intended only for the guidance of the design engineers. The number of boreholes and test pits required to determine the localized underground conditions, especially bedrock elevations between boreholes and test pits 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 interpretation of the factual borehole and test pit results to draw their own conclusions as to how the subsurface conditions may affect them.

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

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

Figures

0 200m 400m 800m

HORIZONTAL 1:20,000

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DATE: MAY 2020	CLIENT: 11654128 CANADA LTD. 6171 HAZELDEAN ROAD, OTTAWA, ON	project no. OTT-00258780-B0
DESIGN: I.T. / CHECKED: I.T.		scale: 1:20,000
DRAWN BY: G.C.	TITLE: SITE LOCATION PLAN	FIG 1

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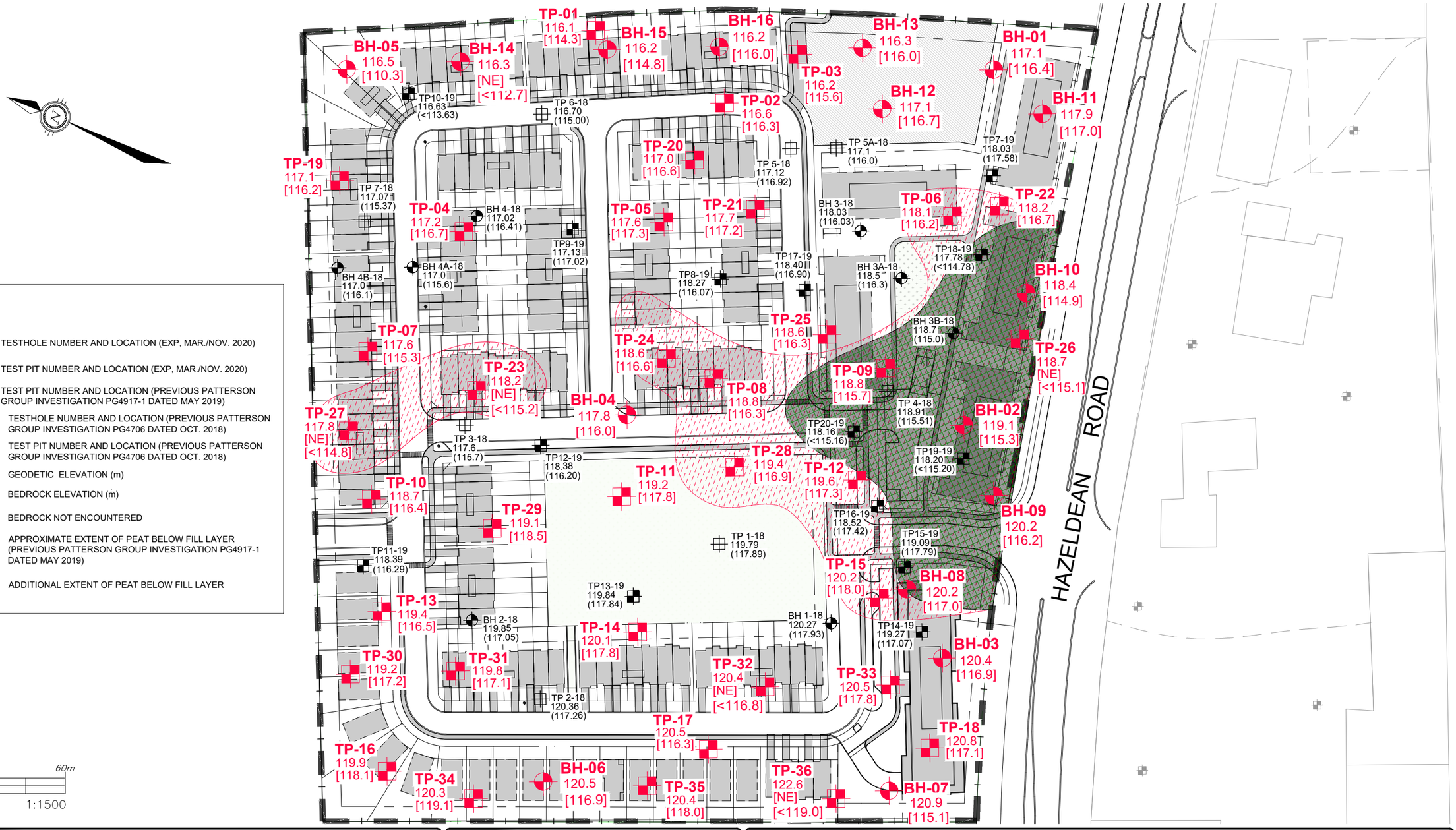

LEGEND

BH-01	TESTHOLE NUMBER AND LOCATION (EXP, MAR./NOV. 2020)
TP-03	TEST PIT NUMBER AND LOCATION (EXP, MAR./NOV. 2020)
TP 1-19	TEST PIT NUMBER AND LOCATION (PREVIOUS PATTERSON GROUP INVESTIGATION PG4917-1 DATED MAY 2019)
BH 1-18	TESTHOLE NUMBER AND LOCATION (PREVIOUS PATTERSON GROUP INVESTIGATION PG4706 DATED OCT. 2018)
TP 1-18	TEST PIT NUMBER AND LOCATION (PREVIOUS PATTERSON GROUP INVESTIGATION PG4706 DATED OCT. 2018)
117.0 116.2	GEODETIC ELEVATION (m)
(115.5) [116.6]	BEDROCK ELEVATION (m)
[NE]	BEDROCK NOT ENCOUNTERED
	APPROXIMATE EXTENT OF PEAT BELOW FILL LAYER (PREVIOUS PATTERSON GROUP INVESTIGATION PG4917-1 DATED MAY 2019)
	ADDITIONAL EXTENT OF PEAT BELOW FILL LAYER

0 15m 30m 60m

HORIZONTAL 1:1500

NOTES :

1. THE BOUNDARIES, ROCK TYPES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT TEST HOLE LOCATIONS. BETWEEN TEST HOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. ROCK CORES AND SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. 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.
6. BASE PLAN OBTAINED FROM SURVEY PLAN BY FAIRHALL, MOFFATT & WOODLAND LTD., JOB NO. Z38800, REFERENCE NO. 415(A) - 12 GOULBOURN, DATED JANUARY 14, 2020.
7. TEST HOLE LOCATION BY OTHERS ARE APPROXIMATE - REFER TO ORIGINAL SITE PLAN FOR ACCURATE POSITION

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

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DATE: MARCH 2021	CLIENT: 11654128 CANADA INC		project no. OTT-00258780-B0
DESIGN: I.T.	CHECKED: I.T.	TITLE: TEST HOLE LOCATION PLAN PROPOSED RESIDENTIAL DEVELOPMENT 6171 HAZELDEAN ROAD, OTTAWA, ON	scale 1:1,500
DRAWN BY: G.C.			FIG 2

Filename: e:\ott\ott-00258780-b0\60 execution\65 drawings\test hole plan 2021-03-01.dwg
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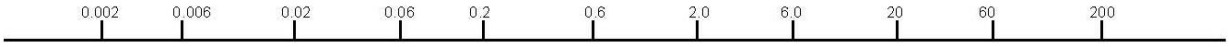
Notes On Sample Descriptions

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

ISSMFE SOIL CLASSIFICATION

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



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

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

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole BH-01

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 'March 24, 2020

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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 Sandy silt, trace gravel, trace clay, contains organics and rootlets, dark brown, moist (compact)	117.1	0	14 (○)	×	SS1	
			116.4					
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, lightly weathered, moderate to closely spaced fractures, (poor to good quality)		1			Run 1	
			115.5					
				2			Run 2	
				3			Run 3	
			112.9	4				
		Borehole Terminated at 4.2 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

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'March 24, 2020	Dry	
May 14, 2020	1.2	
July 2, 2020	2.0	
Jan 25, 2021	1.2	
March 1, 2021	1.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	0.71 - 1.17	100	61
2	1.17 - 2.67	100	34
3	2.67 - 4.22	98	72

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-02

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 'March 24, 2020

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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 ~150 mm thick	119.1	0				
		FILL Silty gravelly sand, trace clay, contains rootlets and organics, brown, moist, no odor	119.0		35	×	SS1	
				1	20	×	SS2	
		PEAT Organic, contains numerous bark pieces and roots, dark brown, very moist, no odor	117.7		4	× 100	SS3	11.1
		MARL Grey, very moist, no odor	116.8	2	1/HW		SS4	
				3	5	×	SS5	
		GLACIAL TILL Gravelly sand, trace silt, trace clay, grey, moist, no odor (very dense)	115.5		50/25 mm	×	Run 1	
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, lightly weathered, moderate to closely spaced fractures, (fair to good quality)	115.3	4				
				5			Run 2	
				6				
							Run 3	
			111.9	7				
		Borehole Terminated at 7.2 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'March 24, 2020	Dry	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.79 - 4.17	100	47
2	4.17 - 5.74	97	39
3	5.74 - 7.24	100	61

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-03

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 5

Page. 1 of 1

Date Drilled: 'March 24, 2020

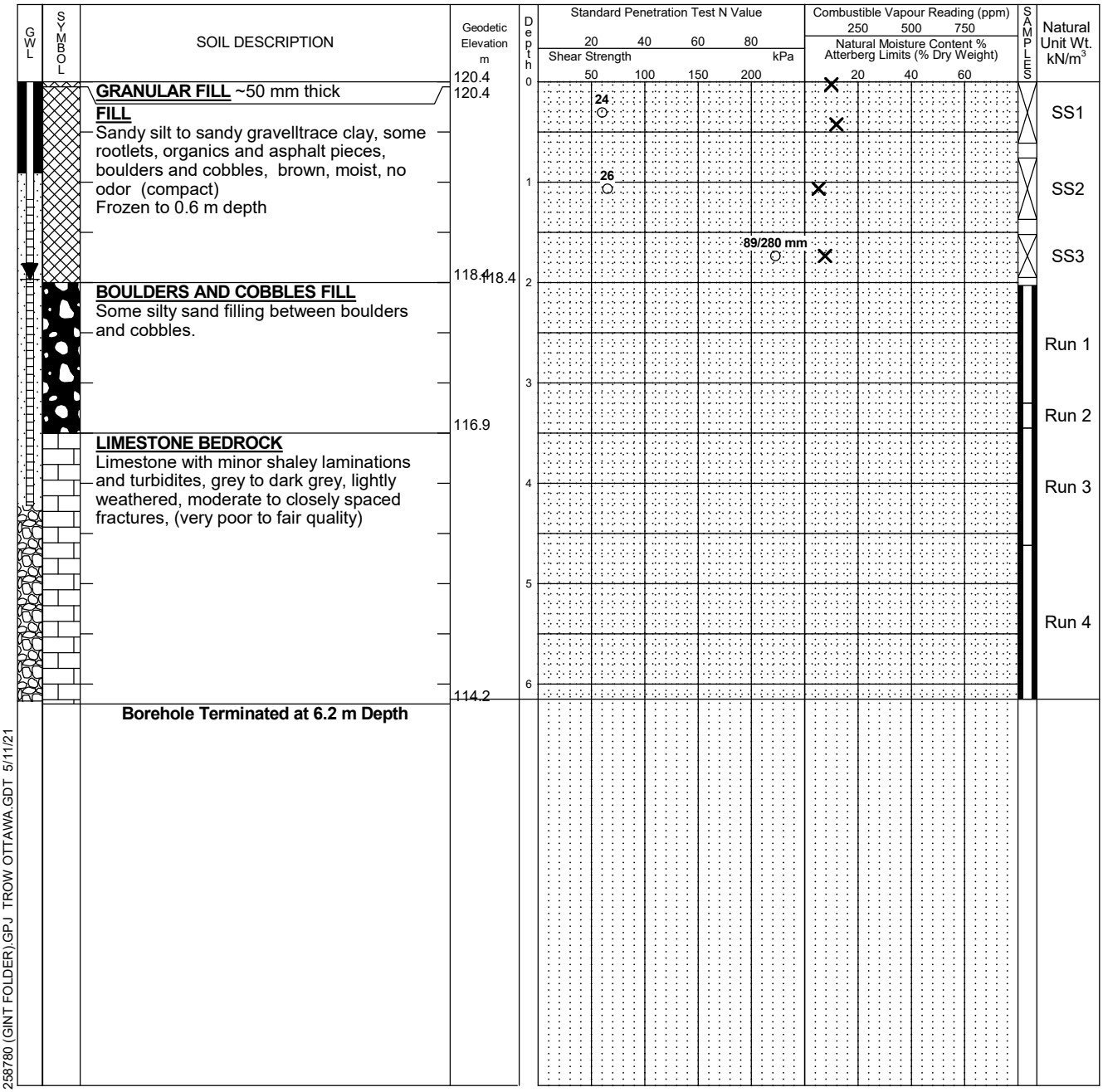
Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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



LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'March 24, 2020	Dry	
May 14, 2020	1.6	
July 2, 2020	2.1	
Jan 25, 2021	2.3	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2 - 3.2		
2	3.2 - 3.5		
3	3.5 - 4.6	61	30
4	4.6 - 6.2	85	48

Log of Borehole BH-04

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 6

Page. 1 of 1

Date Drilled: 'March 24, 2020

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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 gravelly sand to silty sand, trace clay, rootlets and organics, cobbles and boulders, asphalt fill between 0.4 to 0.7 m depth, brown, moist, no odor Frozen to 0.4 m depth	117.8	0	60	×	SS1	
		ORGANIC SANDY SILT Some peat inclusions, green-grey, very moist, no odor	117.1	1	9	×	SS2	20.5
		FILL Silty sand, grey, wet, no odor **Refusal to Augers at 1.8 m Depth**	116.4 / 116.0		50 for 130 mm	×	SS3	

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. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'March 24, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-05

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 7

Page. 1 of 1

Date Drilled: 'March 24, 2020

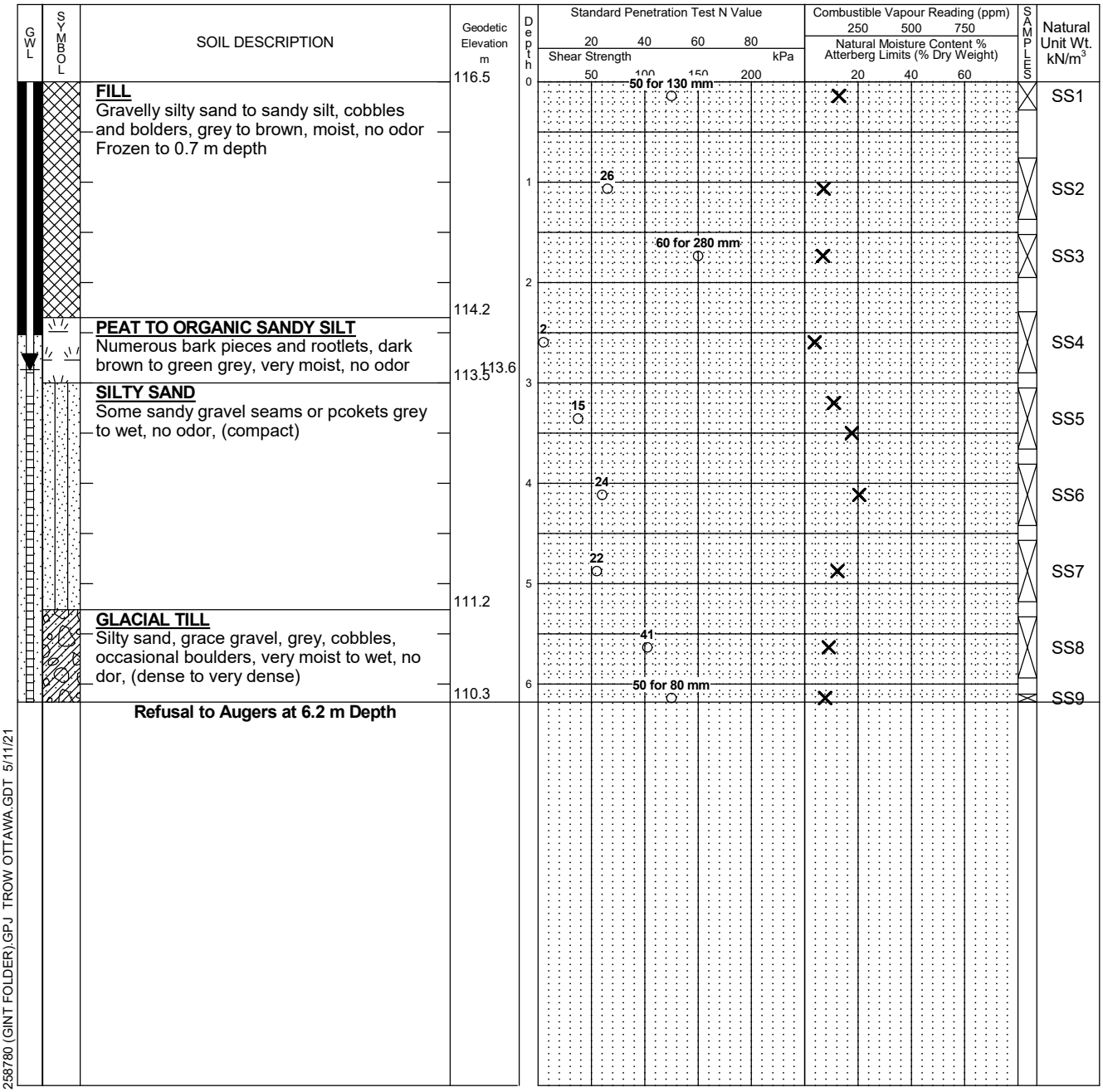
Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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



LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'March 24, 2020	Dry	
May 14, 2020	2.6	
July 2, 2020	2.8	
Jan 25, 2021	2.8	
March 1, 2021	2.9	

CORE DRILLING RECORD

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

Log of Borehole BH-06

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 8

Page. 1 of 1

Date Drilled: 'March 24, 2020

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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 ~200 mm thick, frozen	120.5	0				
		FILL	120.3					
		Sandy silt, trace grave and clay, rootlets and organics, brown, moist, no odor (comapct)			25		SS1	
		Frozen to 0.4 m depth	119.8					
		TILL		1	66		SS2	
		Gravelly silty sand, trace clay, numerous cobbles and boulders, brown, moist, no odor (very dense)			97		SS3	
				2	69		SS4	21.0
				3	60		SS5	
		Refusal to Augers at 3.60 m Depth	116.9					

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. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'March 24, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-07

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 9

Page. 1 of 2

Date Drilled: 'December 9, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		GRANULAR FILL ~250 mm thick	120.9	0				
		FILL Sand and gravel, some cobbles and boulders, grey-brown, moist, (compact)	120.7				AS1	
				1	24		SS2	
		GLACIAL TILL Poorly graded sand with silt and gravel, cobbles and boulders, brown, moist to wet, (compact to very dense)	119.4	2	37		SS3	
					14		SS4	
				3	21		SS5	
		-Boulders below 4.3 m depth	117.3	4	50		SS6	
							Run 1	
				5			Run 2	
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, moderately spaced fractures, (good to excellent quality)	115.1	6				
				7			Run 3	
				8			Run 4	
				9				
				10				

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'December 9, 2020	N/A	
Jan 25, 2021	3.4	
March 1, 2021	3.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.5 - 4.8		
2	4.8 - 6.2		
3	6.2 - 7.7	100	79
4	7.7 - 9.3	100	90
5	9.3 - 10.8	96	96

Log of Borehole BH-07

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 9

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
			110.9	10	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		Run 5
			110.1					
		Borehole Terminated at 10.8 m Depth						

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
December 9, 2020	N/A	
Jan 25, 2021	3.4	
March 1, 2021	3.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.5 - 4.8		
2	4.8 - 6.2		
3	6.2 - 7.7	100	79
4	7.7 - 9.3	100	90
5	9.3 - 10.8	96	96

Log of Borehole BH-08

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 10

Page. 1 of 2

Date Drilled: 'December 9, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		GRANULAR FILL MIXTURE Crusher-run limestone with some pulvarized asphalt, some sand, organic soil and wood chips	120.2	0			AS1	
			119.6					
		FILL Sand and gravel, some organics and wood pieces, brown, moist, (compact)		1	17		SS2	
				2	14		SS3	
			117.8					
		GLACIAL TILL Silty gravel with sand, cobbles and boulders, grey, moist, (dense)		3	34		SS4	
			117.0		50 for 75 mm		SS5	
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, moderately spaced fractures, (poor to excellent quality)		4			Run 1	
				5				
				6			Run 2	
				7			Run 3	
				8				
				9			Run 4	
				10				

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'December 9, 2020	N/A	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.2 - 4.7	100	42
2	4.7 - 6.2	100	60
3	6.2 - 7.7	100	67
4	7.7 - 9.3	100	95
5	9.3 - 10.8	100	100

Log of Borehole BH-08

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 10

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
			110.2	10	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		Run 5
			109.4					
		Borehole Terminated at 10.8 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
December 9, 2020	N/A	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.2 - 4.7	100	42
2	4.7 - 6.2	100	60
3	6.2 - 7.7	100	67
4	7.7 - 9.3	100	95
5	9.3 - 10.8	100	100

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-09

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 11

Page. 1 of 1

Date Drilled: 'December 9, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 ~150 mm thick	120.2	0				
		FILL Silty sand with gravel, some boulder pieces, brown, (compact)	120.1				AS1	
				1	20		SS2	
		PEAT Organic, contains numerous bark pieces and roots, dark brown, very moist, no odor, (loose)	118.4	2	5	107	SS3	
			117.7		4		SS4	
		GLACIAL TILL Silty gravel with sand, cobbles and boulders, brown to grey, moist to wet, (compact)		3	19		SS5	
				4	50 for 75 mm		SS6	
		WEATHERED LIMESTONE BEDROCK Grey	116.2					
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, close to moderately spaced fractures, (fair quality)	115.9	5			Run 1	
				6			Run 2	
		Borehole Terminated at 6.4 m Depth	113.8					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'December 9, 2020	N/A	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.3 - 4.8	100	68
2	4.8 - 6.4	100	63

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-10

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 12

Page. 1 of 1

Date Drilled: 'December 10, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 ~100 mm thick	118.4	0				
		FILL Sand and gravel, occasional boulder pieces, brown, (loose)	118.3				AS1	
			117.4	1	6		SS2	
		PEAT Organic, contains numerous bark pieces and roots, dark brown, very moist, no odor			2		SS3	
▽			116.3	2				
			115.7		5		SS4	
		GLACIAL TILL Silty gravel with sand, cobbles and boulders, brown to grey, moist to wet, (dense)		3	44		SS5	
			114.9					
		WEATHERED LIMESTONE BEDROCK Grey	114.6					
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, close to moderately spaced fractures, (fair to good quality)		4			Run 1	
				5			Run 2	
			112.2	6				
		Borehole Terminated at 6.2 m Depth						

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'December 10, 2020	N/A	
Jan 25, 2021	2.1	
March 1, 2021	2.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.8 - 4.8	100	68
2	4.8 - 6.2	100	79

Log of Borehole BH-11

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 13

Page. 1 of 1

Date Drilled: 'December 10, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 Sand and gravel, occasional boulder pieces, brown, (loose)	117.9	0			AS1	
					50 for 75 mm		AS2	
		WEATHERED LIMESTONE BEDROCK Grey	117.0	1			Run 1	
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, close to moderately spaced fractures, (very poor to good quality)	116.7	2			Run 2	
				3				
				4			Run 3	
				5			Run 4	
				6				
		Borehole Terminated at 6.3 m Depth	111.6					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'December 10, 2020	N/A	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.2 - 1.8	92	0
2	1.8 - 3.3	100	18
3	3.3 - 4.8	100	62
4	4.8 - 6.3	100	78

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-12

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 14

Page. 1 of 1

Date Drilled: 'February 23, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 Sand and gravel, frozen, brown, moist	117.1 116.7	0			AS1	
		LIMESTONE BEDROCK Limestone with minor shaley laminations and turbidites, grey to dark grey, lightly weathered, moderate to closely spaced fractures, (very poor to fair quality)		1			Run 1 Run 2	
			115.6	2				
				3			Run 3	
		Borehole Terminated at 3.7 m Depth	113.4					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'February 23, 2020	N/A	
March 1, 2021	1.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	0.4 - 0.6	80	0
2	0.6 - 2.1	100	58
3	2.1 - 3.7	100	53

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-13

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 15

Page. 1 of 1

Date Drilled: 'February 23, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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	116.3	0
		Sand and gravel, frozen, brown, moist	116.0	
		LIMESTONE BEDROCK		
		Limestone with minor shaley laminations and turbidites, grey to dark grey, lightly weathered, moderate to closely spaced fractures, (very poor to fair quality)	115	1
				2
				3
			112.7	
		Borehole Terminated at 3.6 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: AS1, Run 1, Run 2, Run 3

Natural Unit Wt. kN/m³

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 32 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-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'February 23, 2020	N/A	
March 1, 2021	1.3	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	0.3 - 0.3	100	0
2	0.6 - 2.1	100	60
3	2.1 - 3.6	100	58

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-14

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 16

Page. 1 of 1

Date Drilled: 'February 23, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 Gravelly silty sand to sandy silt, some topsoil, cobbles and bolders, grey to brown, moist to wet, no odor, (dense to compact) -Frozen to 0.7 m depth	116.3	0			AS1	
				1	33		SS2	
					16		SS3	22.2
		GLACIAL TILL Silty sand with gravel, grey, cobbles and boulders, wet, no odor, (compact)	114.2	2			SS4	21.5
					16			
				3	23		SS5	
		Borehole Terminated at 3.6 m Depth	112.7					

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 data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'February 23, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-15

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 17

Page. 1 of 1

Date Drilled: 'February 23, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 to gravelly sand, some wood pieces and organic material, petroleum odor, (compact)	116.2	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60	AS1	
				1	14		SS2	18.6
			114.8					
		Auger Refusal at 1.4 m depth						

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'February 23, 2020	Dry	

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

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole BH-16

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 18

Page. 1 of 1

Date Drilled: 'February 23, 2020

Drill Type: CME 75 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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	116.2	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
		Sand and gravel, brown, moist	116.0			×		
		Auger Refusal at 0.2 m depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258780-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'February 23, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Borehole TP-01

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 19

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type:

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 Gravelly sand to sand and gravel, some wood pieces, concrete pieces brick pieces and organic material, some petroleum odor below 0.9 m depth.	116.1	0	20 40 60 80 Shear Strength 50 100 150 200 kPa	250 500 750 Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60		
				1				
		Refusal to Excavator Bucket at 1.8 m Depth on Inferred Bedrock	114.3					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-02

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 20

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		SAND AND GRAVEL FILL ~300 mm thick	116.6	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
		WEATHERED BEDROCK Weathered limestone bedrock, petroleum odour	116.3					
		Refusal to Excavator Bucket at 0.7 m Depth on Inferred Bedrock	115.9					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-03

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 21

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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 Gravelly sand to silty sand, some cobbles and boulders, clayey silt inclusions, brown, moist, no odor	116.2	0	20 40 60 80 50 100 150 200	250 500 750 20 40 60		
		Refusal to Excavator Bucket at 0.6 m Depth on Inferred Bedrock	115.6					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-04

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 22

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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 Gravelly sand to silty sand, cobbles and boulders, some clayey silt inclusions, brown, moist	117.2	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			116.7					
		Refusal to Excavator Bucket at 0.5 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-05

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 23

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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
					20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
		TOPSOIL ~100 mm thick	117.6	0				
		FILL	117.5					
		Silty sand, some gravel, brown, moist, no odor	117.3					
		Refusal to Excavator Bucket at 0.3 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-06

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 24

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL Gravelly sand to silty sand, cobbles and boulders, rootlets and organics, brown, moist, no odor	118.1	0
		PEAT Numerous bark pieces and rootlers, dark brown, very moist, no odor	117.3	1
▼		**MARL** Green-grey, minor oxidization staining, very moist, no odor	116.7	
		Refusal to Excavator Bucket at 1.9 m Depth on Inferred Bedrock	116.4 116.2	

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	1.7	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-07

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 25

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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
		FILL Gravelly sand to sandy silt, some clay, cobbles and boulders, brown, moist	117.6	0
		FILL Silty sand, some gravel, cobbles, boulders and wood pieces, brown, moist	117.0	1
		PEAT Organic, numerous bark pieces and rootlers, dark brown, very moist, no odor	116.3	
		GLACIAL TILL Gravelly silty sand, numerous cobbles and boulders, grey, wet	116.1	2
		Refusal to Excavator Bucket at 2.3 m Depth on Inferred Bedrock	115.3	

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-08

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 26

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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 Gravelly sand to silty sand, cobbles, boulderrs and wood pieces, brown, moist	118.8	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		PEAT Organic, numerous bark pieces and rootlets, dark brown, very moist, no odor	117.6	1			100 GS1	
		MARL Green-grey to grey, oxidized stains, very moist to wet, no odor	117.1				GS2	
		GLACIAL TILL Gravelly sand, some silt, numerous cobbles and boulders, grey, wet	116.8	2				
		Refusal to Excavator Bucket at 2.5 m Depth on Inferred Bedrock	116.3					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-09

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 27

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL Gravelly sand, trace silt, brown, moist, no odor	118.8	0
		FILL Silty sand, some gravel, contains cobbles and boulders, contains wood pieces, brown, moist	118.5	
		MARL Green grey, moist	117.6	1
		PEAT Numerous bark pieces and rootletrs, dark brown, very moist, no odor	117.3	
		CLAY CRUST Silty clay, trace sand and gravel, light brown, no odor	116.8	2
		MARL Green-grey to dark grey, very moist, no odor	116.3	
		Refusal to Excavator Bucket at 3.1 m Depth on Inferred Bedrock	115.7	3

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: 100 GS1; GS2

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-10

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 28

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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, some gravel and frequent wood pieces, brown, moist	118.7	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			117.6	1			GS1	
		FILL Silty gravelly sand, numerous cobbles and boulders, brown, moist to wet						
			116.4	2				
		Refusal to Excavator Bucket at 2.3 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-11

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 29

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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
			119.2	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		TOPSOIL ~ 100 mm	119.1					
▼		**FILL** Silty gravelly sand, contains numerous cobbles and boulders, large concrete slabs throughout, brown, moist to wet	118.3	1		×	GS1	
		Refusal to Excavator Bucket at 1.4 m Depth on Inferred Bedrock	117.8					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	0.9	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-12

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 30

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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
		TOPSOIL ~150 mm	119.6	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			119.5					
		FILL Silty sand, some gravel, cobbles, boulders and wood pieces, brown, moist		1				
▼			118.4					
			117.6	2			100	GS1
		PEAT Organic, numerous bark pieces and rootlets, dark brown, very moist, no odor	117.3					
		Refusal to Excavator Bucket at 2.3 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	1.2	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-13

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 31

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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
		TOPSOIL ~ 220 mm	119.4	0
		FILL Silty gravelly sand, numerous cobbles and boulders, large concrete slabs throughout, brown, moist to wet, no odor	119.2	
▼			116.8	2
		Refusal to Excavator Bucket at 2.9 m Depth on Inferred Bedrock	116.5	

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	2.6	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-14

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 32

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL Granular fill over silty sand and gravel, wood pieces, brown, moist, no odor	120.1	0
		BOULDERS AND COBBLES FILL Some silty sand inclusions - possible till in lower levels	119.4	1
			117.8	2
		Refusal to Excavator Bucket at 2.3 m Depth on Inferred Bedrock		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-15

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 33

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	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 Granular fill (150mm) OVER silty sand with gravel, rootlets and asphalt pieces, cobbles and blulders below 0.8 m depth, brown, moist, no odor	120.2	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
				1				
			118.8					
		PEAT Organic, numerous bark pieces and roots, dark brown, very moist, no odor	118.5			×	GS1	
		GLACIAL TILL Gravelly sand, trace silt and gravel, oxidized stains, numerous cobbles and boulders, brown, wet	118.0	2				
		Refusal to Excavator Bucket at 2.2 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-16

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 34

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL Silty sand, some gravel, wood pieces troughout, brown, moist	119.9	0
		SILTY SAND (POSSIBLE TILL) Silty gravelly sand, numerous cobbles and boulders, brown, moist to wet	118.9	1
		Refusal to Excavator Bucket at 1.8 m Depth on Inferred Bedrock	118.1	

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-17

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 35

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Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL 150 mm granular fill OVER silty sand and gravel, rootlers, brown, moist, no odor	120.5	0
		BOULDERS AND COBBLES FILL Gravelly silty sand inclusions , some wood pieces, moist	120.0	
		SILTY GRAVELLY SAND (POSSIBLE TILL) numerous cobbles and boulders, brown, wet	118.9	1
▼			117.4	3
		Refusal to Excavator Bucket at 4.2m Depth on Inferred Bedrock	116.3	4

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	3.1	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-18

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 36

Page. 1 of 1

Date Drilled: 'March 17, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL Granular fill OVER Silty sand with some gravel, brown, moist, no odor	120.8	0
		BOULDERS AND COBBLES FILL Gravelly silty sand inclusions, brown, moist	120.3	1
		SILTY GRAVELLY SAND (POSSIBLE TILL) Numerous boulders and cobbles, brown, moist	118.8	2
			117.1	3
		Refusal to Excavator Bucket at 3.7 m Depth on Inferred Bedrock		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'March 17, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-19

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 37

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 Sand and gravel, some brick pieces, concrete pieces and tree roots, brown, no odor	117.1	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		Refusal to Excavator Bucket at 0.9 m Depth on Inferred Bedrock	116.2					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-20

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 38

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
			117	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
		TOPSOIL ~50 mm thick	116.9					
		SAND AND GRAVEL FILL Brown, moist	116.6					
		WEATHERED BEDROCK Weathered limestone bedrock	116.4					
		Refusal to Excavator Bucket at 0.6 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-21

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 39

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~50 mm thick	117.7	0				
		SILTY SAND TILL WITH GRAVEL FILL Brown, moist	117.6					
		Refusal to Excavator Bucket at 0.5 m Depth on Inferred Bedrock	117.2					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-22

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 40

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~125 mm thick	118.2	0
		SAND AND GRAVEL FILL Some pieces of wood and tree roots, brown, moist	118.1	
		PEAT Numerous bark pieces and rootlers, dark brown, very moist, no odor	117.6	
		SILTY SAND TILL WITH GRAVEL Some cobbles and boulders, brown, moist	117.3	1
		Refusal to Excavator Bucket at 1.5 m Depth on Inferred Bedrock	116.7	

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-23

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 41

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~100 mm thick	118.2	0
		SAND AND GRAVEL FILL Some concrete pieces, brick piecs and wood pieces, brown, moist	118.1	
		PEAT Numerous bark pieces and rootlers, dark brown, very moist, no odor	117.3	1
		SILTY SAND TILL WITH GRAVEL Occasional cobbles and boulders, brown, moist to wet	117.0	
			115.2	3
		Test Pit Terminated at 3.0 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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	2.1	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-24

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 42

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~250 mm thick	118.6	0
		SAND AND GRAVEL FILL Some concrete pieces, brick piecs and wood pieces, brown, moist	118.4	
		PEAT Dark brown, very moist, no odor	117.6	1
		SILTY SAND TILL WITH GRAVEL Occasional cobbles and boulders, brown, moist to wet	117.3	
		Refusal to Excavator Bucket at 2.0 m Depth on Inferred Bedrock	116.6	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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-25

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 43

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		SAND AND GRAVEL FILL Some concrete pieces, brick piecs, wood pieces, bark and cobbles, brown, moist	118.6	0	20 40 60 80 50 100 150 200 kPa	250 500 750 20 40 60		
			117.3	1				
		SILTY SAND TILL WITH GRAVEL Occasional cobbles and boulders, brown, moist to wet		2				
			116.3					
		Refusal to Excavator Bucket at 2.3 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-26

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 44

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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 Sand and gravel, some wood pieces, brick pieces and concrete piecees, brown, moist	118.7	0
			117.5	1
		PEAT Dark brown, very moist, no odor	116.6	2
		MARL Green-grey, minor oxidization staining, very moist, no odor	116.0	
		SILTY SAND TILL WITH GRAVEL Occasional cobbles and boulders, brown, moist to wet	115.1	3
		Test Pit Terminated at 3.6 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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	3.0	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-27

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 45

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~100 mm thick	117.8	0
		FILL Sand and gravel, some wood pieces and brick pieces, brown, moist	117.7	
		PEAT Dark brown, very moist, no odor	116.9	1
		SILTY SAND TILL WITH GRAVEL Occasional cobbles and boulders, brown, moist	115.7	2
		Test Pit Terminated at 3.0 m Depth	114.8	3

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	2.1	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-28

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 46

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Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~100 mm thick	119.4	0
		FILL Sand and gravel, some wood pieces, concrete pieces and brick pieces, brown, moist	119.3	
		PEAT Dark brown, very moist, no odor	117.8	1
		SILTY SAND TILL WITH GRAVEL Occasional cobbles and boulders, brown, moist	117.5	
		Refusal to Excavator Bucket at 2.5 m Depth on Inferred Bedrock	116.9	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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	2.1	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-29

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 47

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		SAND AND GRAVEL FILL ~600 mm thick	119.1	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			118.5					
		WEATHERED BEDROCK Weathered limestone bedrock, petroleum odour		1				
			117.9					
		Refusal to Excavator Bucket at 1.2 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-30

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 48

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~100 mm thick	119.2	0
		SAND AND GRAVEL TILL Occasional cobbles and boulders, brown, moist	118.9	
			117.2	2
		Refusal to Excavator Bucket at 2.0 m Depth on Inferred Bedrock		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-31

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 49

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~150 mm thick	119.8	0
		SAND AND GRAVEL TILL Occasional cobbles and boulders, brown, moist	119.7	
				1
				2
			117.1	
		Refusal to Excavator Bucket at 2.7 m Depth on Inferred Bedrock		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-32

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 50

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~150 mm thick	120.4	0
		SILTY SAND WITH GRAVEL TILL Occasional cobbles and boulders, brown to grey, moist to wet	120.2	1
				2
				3
			116.8	
		Test Pit Terminated at 3.6 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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	2.7	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-33

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 51

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~150 mm thick	120.5	0
		GRANULAR FILL ~ 500 mm of crusher-run limestone	120.4	
		SILTY SAND WITH GRAVEL TILL Occasional cobbles and boulders, brown to grey, moist to wet	119.9	1
				2
		Refusal to Excavator Bucket at 2.7 m Depth on Inferred Bedrock	117.8	
		Note: Depth of bedrock varies between 1.8 m to 2.7 m within the excavated test pit		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-34

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 52

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~175 mm thick	120.3	0
		SILTY SAND WITH GRAVEL TILL Occasional cobbles and boulders, brown to grey, moist	120.1	
			119.1	1
		Refusal to Excavator Bucket at 1.2 m Depth on Inferred Bedrock		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-35

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 53

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		GRANULAR FILL	120.4	0
		~ 100 mm of crusher-run limestone	120.3	
		SAND AND GRAVEL FILL Occasional boulders, brown, moist		
			119.9	
		SILTY SAND WITH GRAVEL TILL Occasional cobbles and boulders, brown to grey, moist to wet		1
				2
			118.0	
		Refusal to Excavator Bucket at 2.4 m Depth on Inferred Bedrock		
		Note: Depth of bedrock varies between 1.8 m to 2.4 m within the excavated test pit		

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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	Dry	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

Log of Test Pit TP-36

Project No: OTT-00258780-B0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 6171 Hazeldean Road, Ottawa, Ontario

Figure No. 54

Page. 1 of 1

Date Drilled: 'November 25, 2020

Drill Type: CAT 320D Excavator

Datum: Geodetic Elevation

Logged by: A.N. Checked by: M.L.

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
		TOPSOIL ~175 mm thick	122.6	0
		SILTY SAND WITH GRAVEL TILL Occasional cobbles and boulders, brown to grey, moist to wet	122.3	1
			119.0	3
		Test Pit Terminated at 3.6 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 compacted 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-00258780-B0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'November 25, 2020	3.0	

CORE DRILLING RECORD

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

LOG OF TEST PIT TP LOGS - 258780 (GINT FOLDER).GPJ TROW OTTAWA.GDT 5/11/21

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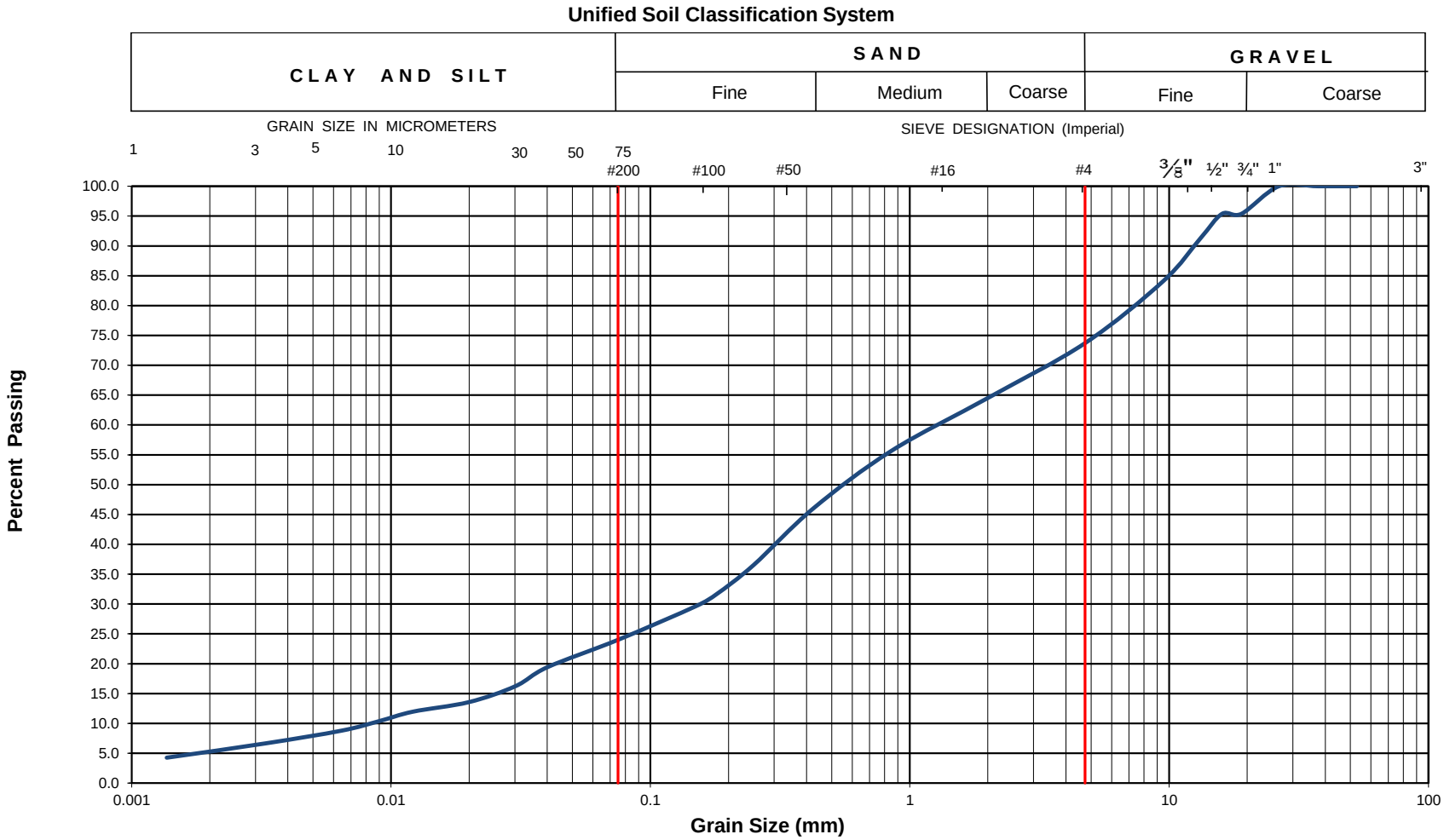
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**March 20, 2020**	**Borehole No:**	**BH2**	**Sample No.:**	**SS2**	**Depth (m) :**	**0.8-1.4**		
Sample Description :		**% Silt and Clay**	**24**	**% Sand**	**50**	**% Gravel**	**26**	**Figure :**	**55**
Sample Description :		**Silty Gravelly Sand (SM)**							

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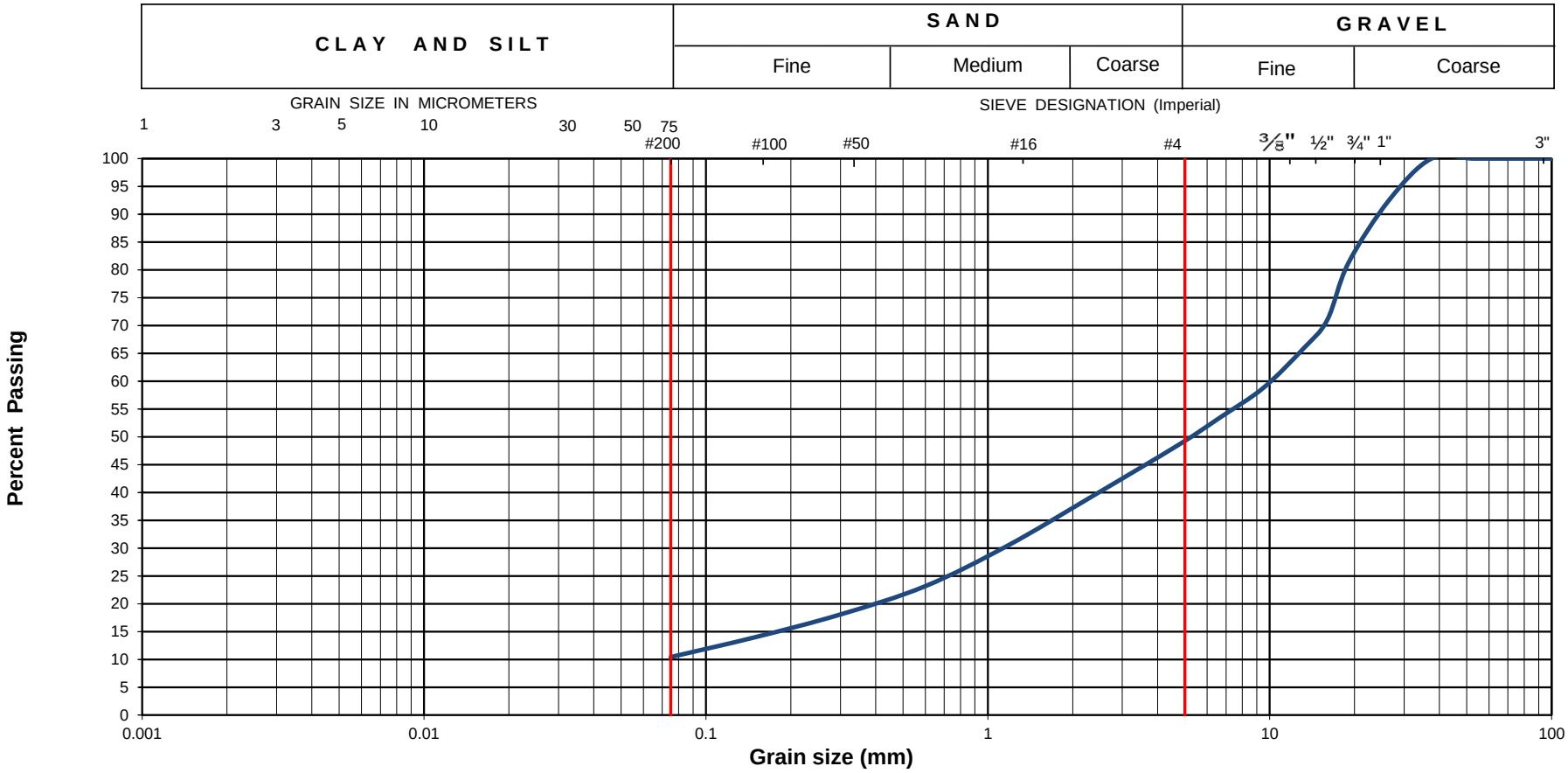
Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**					
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**					
Date Sampled :	**March 24, 2020**	**Borehole No:**	**BH3**	**Sample:**	**SS2**	**Depth (m) :**	**0.8-1.4**	
Sample Composition :		**Gravel (%)**	**51**	**Sand (%)**	**39**	**Silt & Clay (%)**	**10**	**Figure :** **56**
Sample Description :	**Fill: Well Graded Sandy Gravel with Silt (GW)**							

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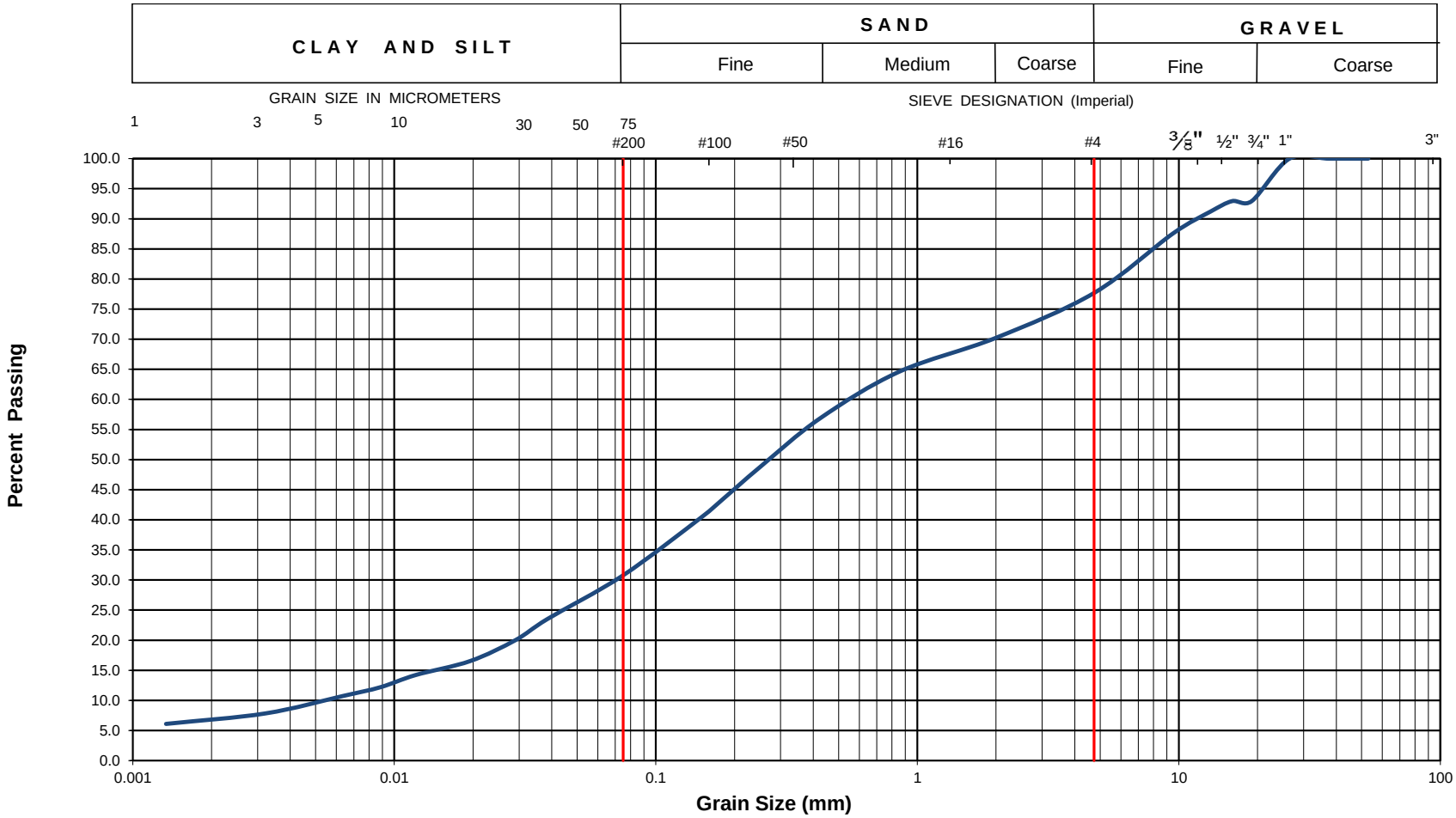
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

Unified Soil Classification System



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**March 24, 2020**	**Borehole No:**	**BH4**	**Sample No.:**	**SS1**	**Depth (m) :**	**0-0.6**		
Sample Description :		**% Silt and Clay**	**31**	**% Sand**	**47**	**% Gravel**	**22**	**Figure :**	**57**
Sample Description :		**Fill: Silty Sand with Gravel (SM)**							

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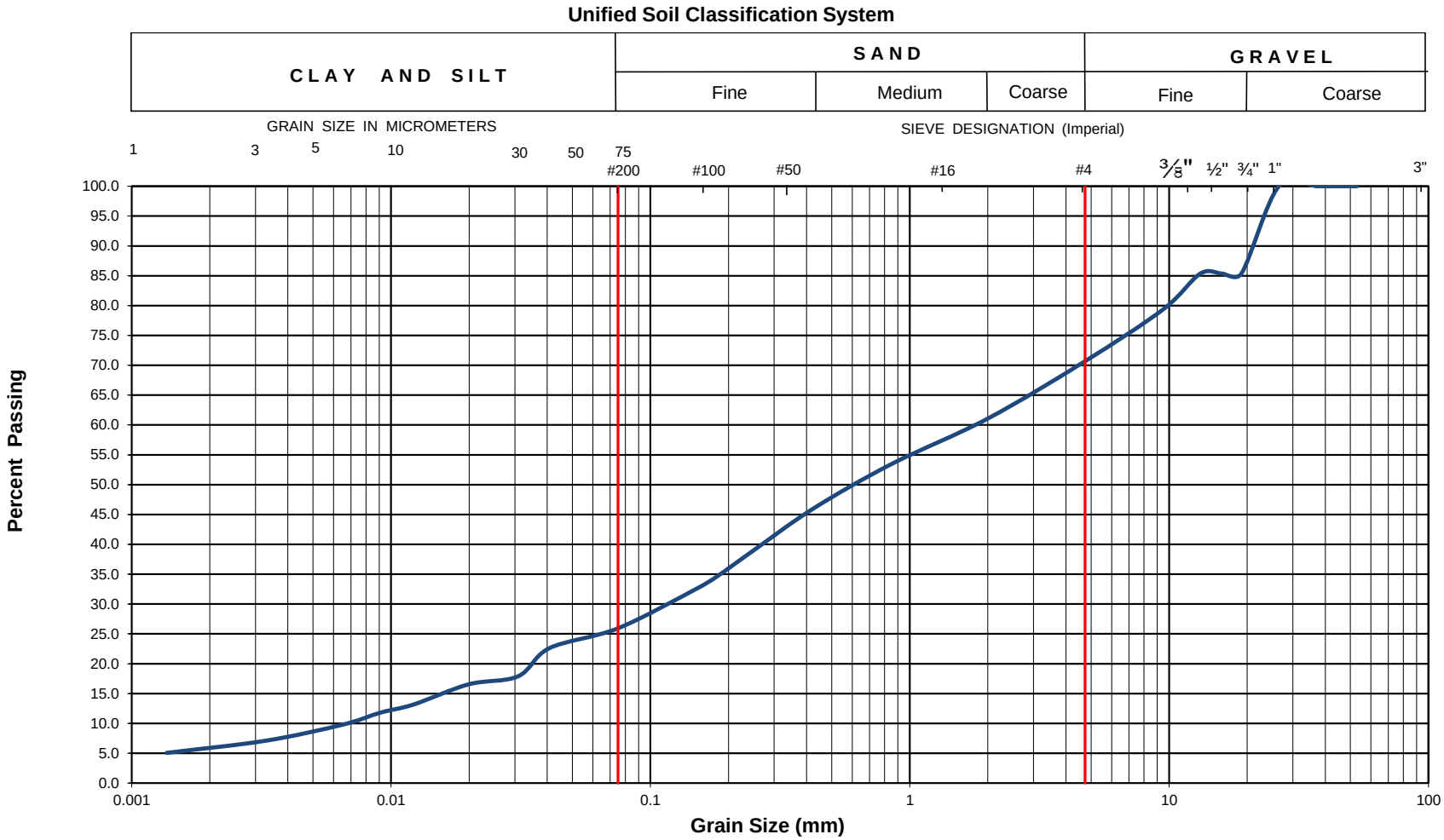
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**December 9, 2020**	**Borehole No:**	**BH9**	**Sample No.:**	**SS2 & SS3**	**Depth (m) :**	**0.8-2.1**		
Sample Description :		**% Silt and Clay**	**26**	**% Sand**	**45**	**% Gravel**	**29**	**Figure :**	**58**
Sample Description :		**Fill: Silty Sand with Gravel (SM)**							

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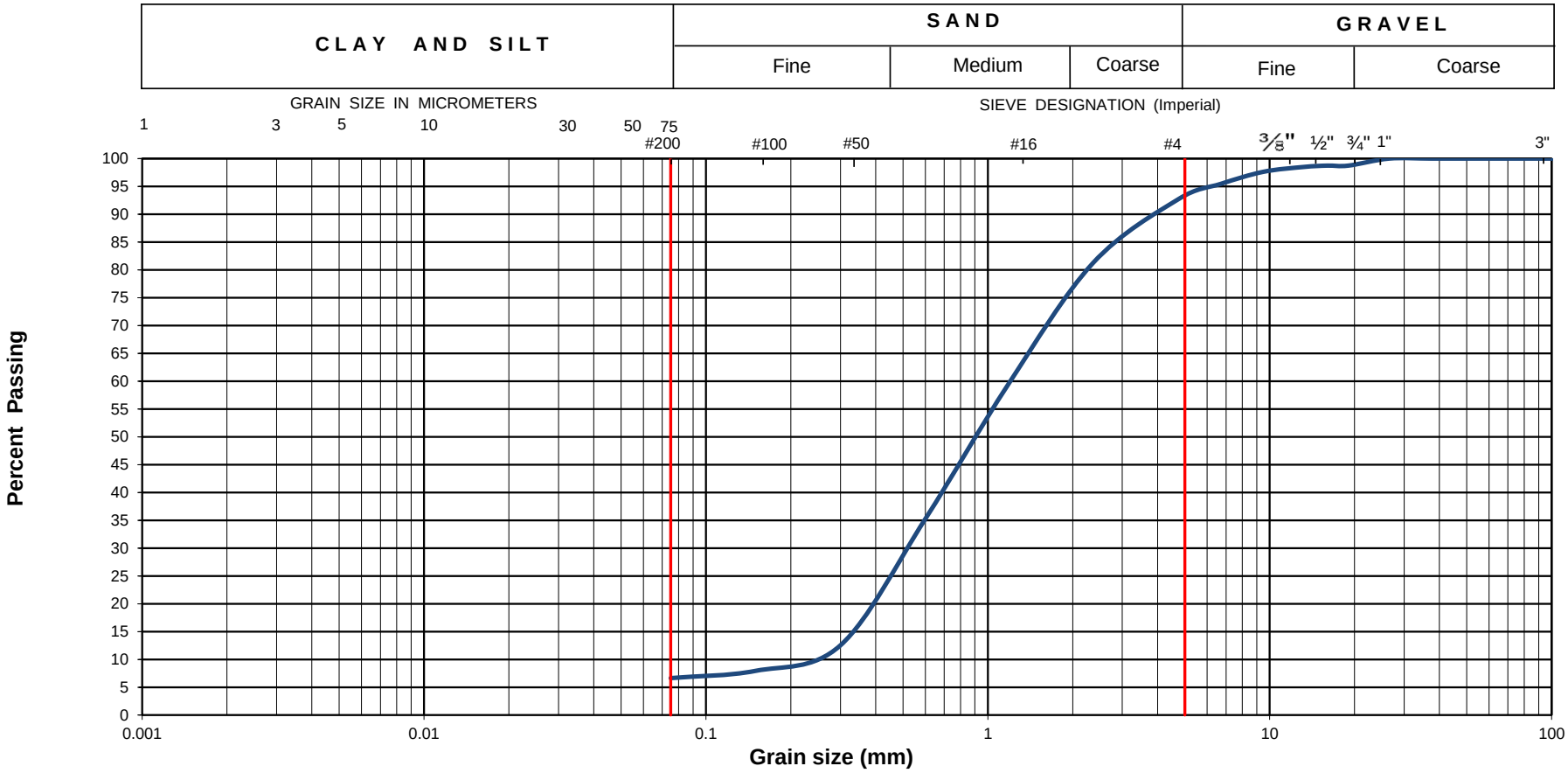
Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**March 17, 2020**	**Borehole No:**	**TP14**	**Sample:**	**Fill**	**Depth (m) :**	**0-0.7**		
Sample Composition :		**Gravel (%)**	**7**	**Sand (%)**	**86**	**Silt & Clay (%)**	**7**	**Figure :**	**59**
Sample Description :		**Fill: Well Graded Sand with Silt (SW)**							

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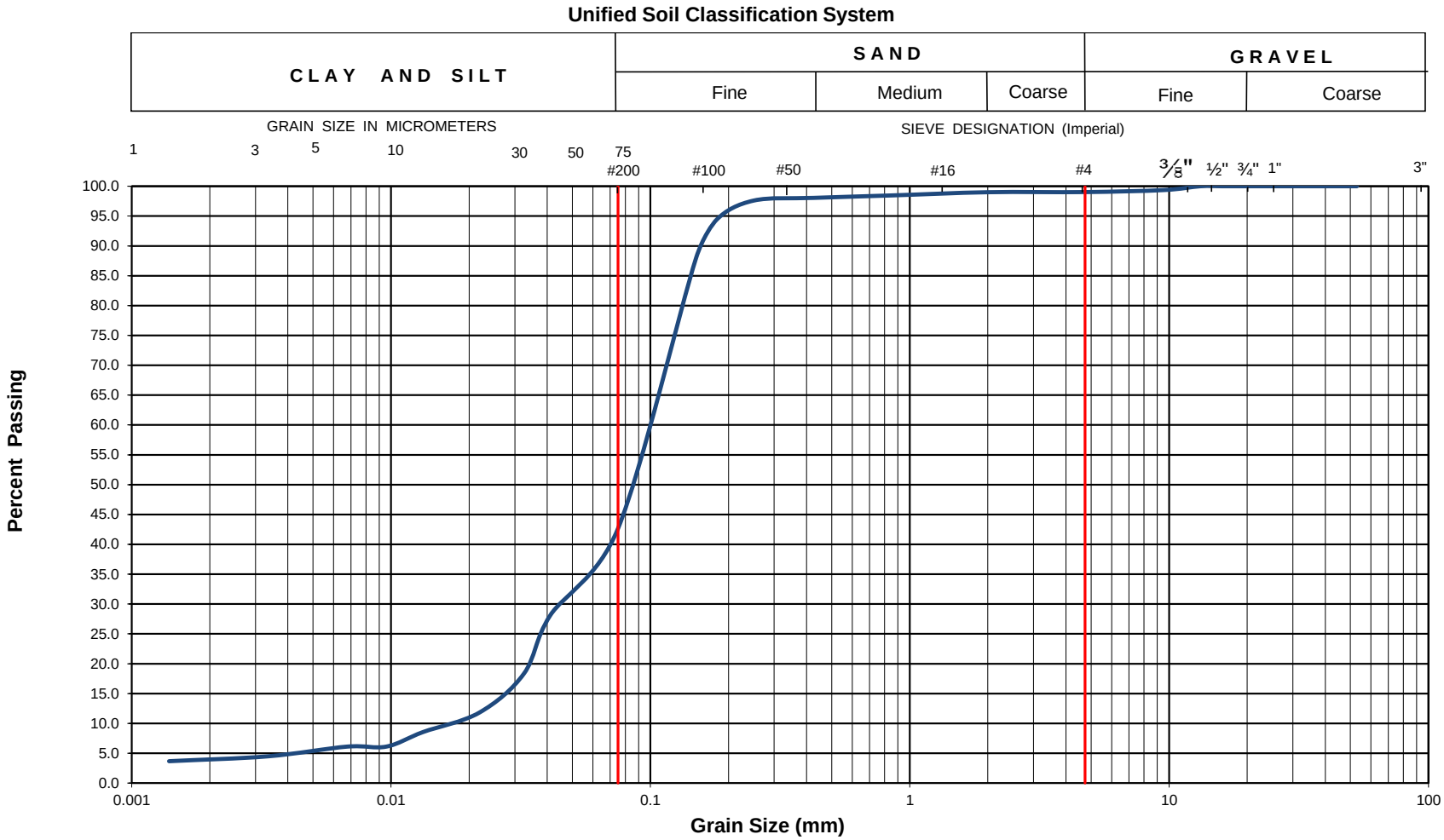
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**March 24, 2020**	**Borehole No:**	**BH5**	**Sample No.:**	**SS6**	**Depth (m) :**	**3.8-4.4**		
Sample Description :		**% Silt and Clay**	**43**	**% Sand**	**56**	**% Gravel**	**1**	**Figure :**	**60**
Sample Description :		**Silty Sand (SM)**							

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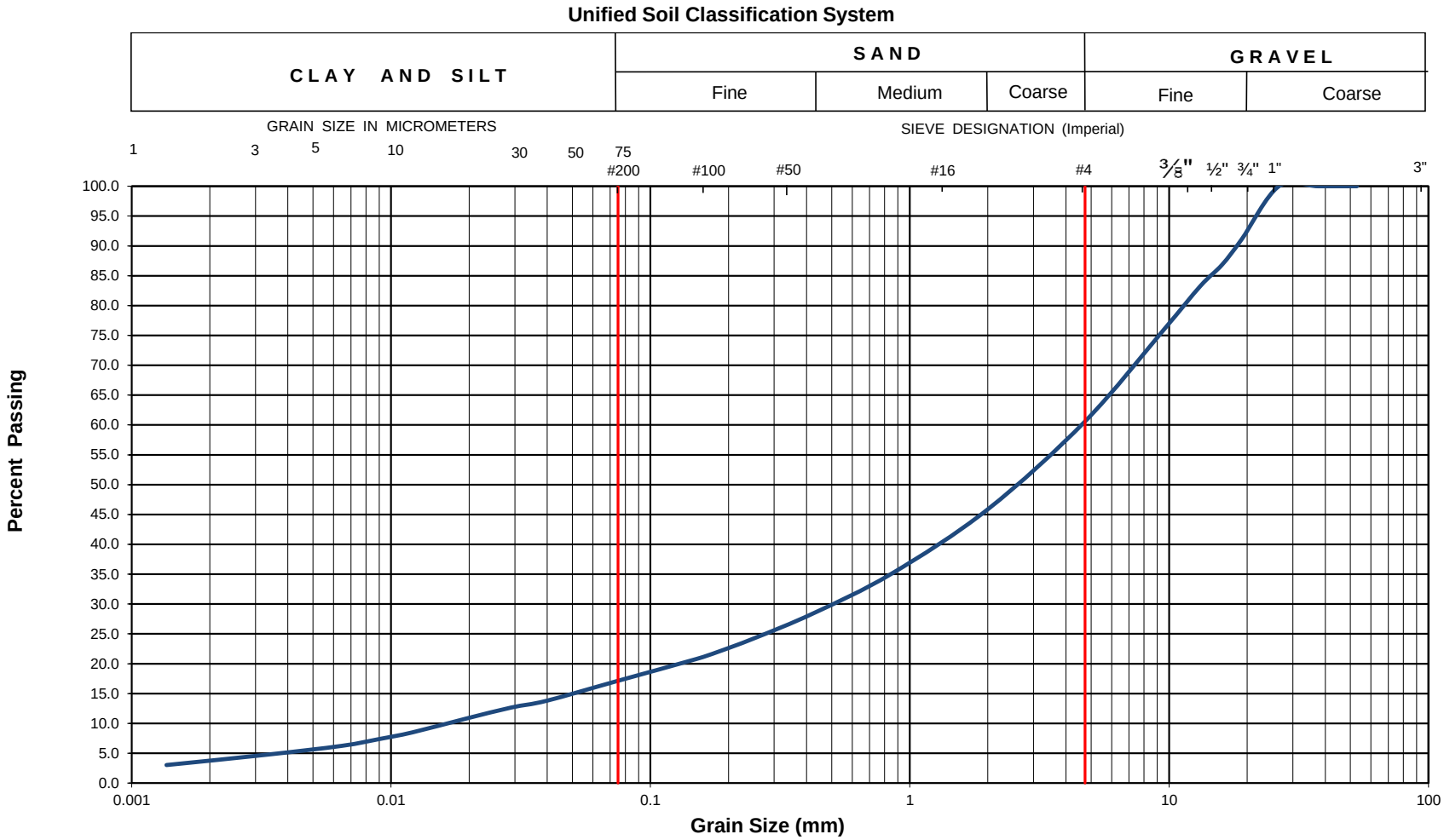
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**March 24, 2020**	**Borehole No:**	**BH6**	**Sample No.:**	**SS5**	**Depth (m) :**	**3.0-3.6**		
Sample Description :		**% Silt and Clay**	**17**	**% Sand**	**44**	**% Gravel**	**39**	**Figure :**	**61**
Sample Description :		**Glacial Till: Silty Sand with Gravel (SM)**							

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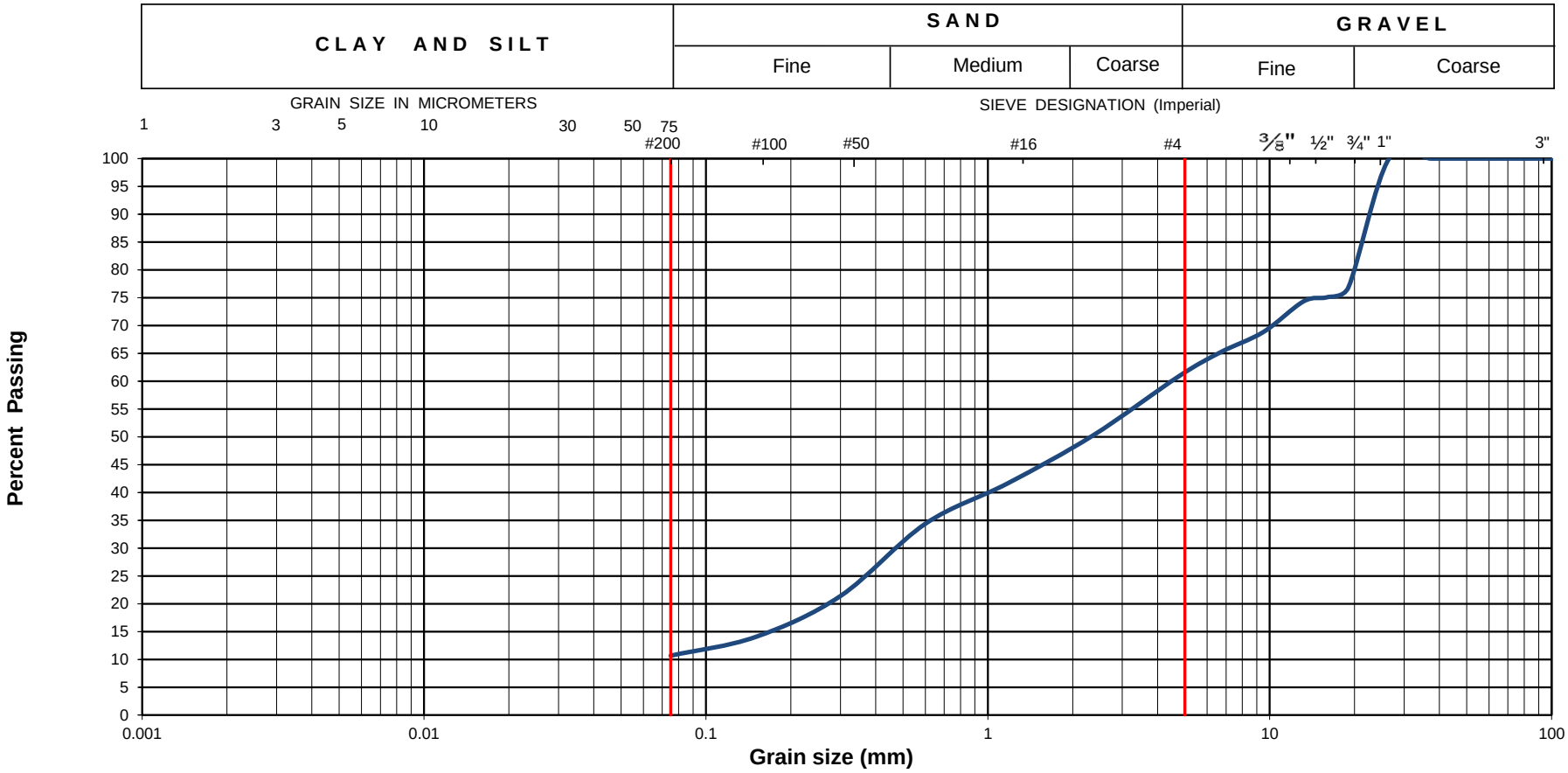
Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

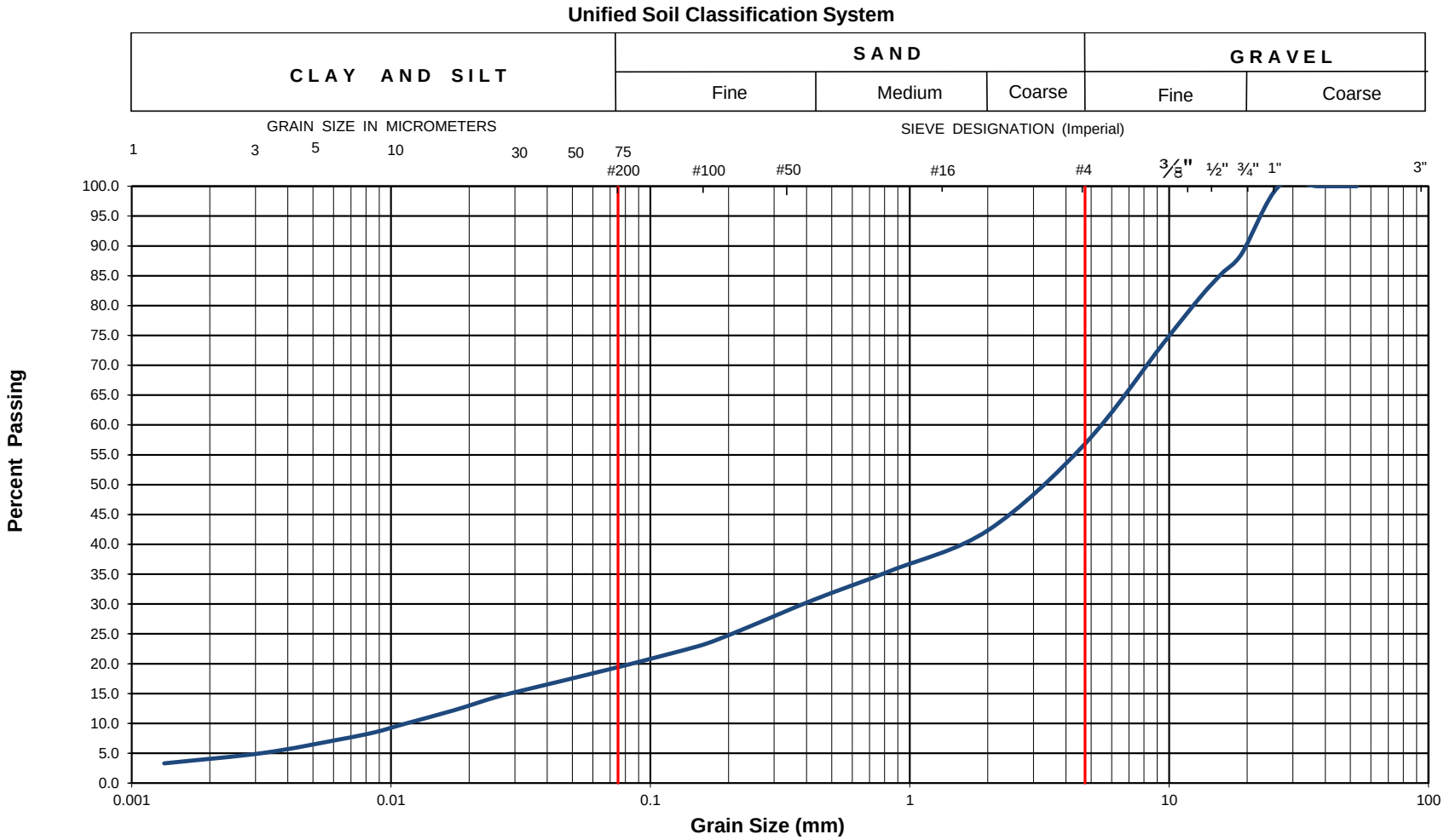
Unified Soil Classification System



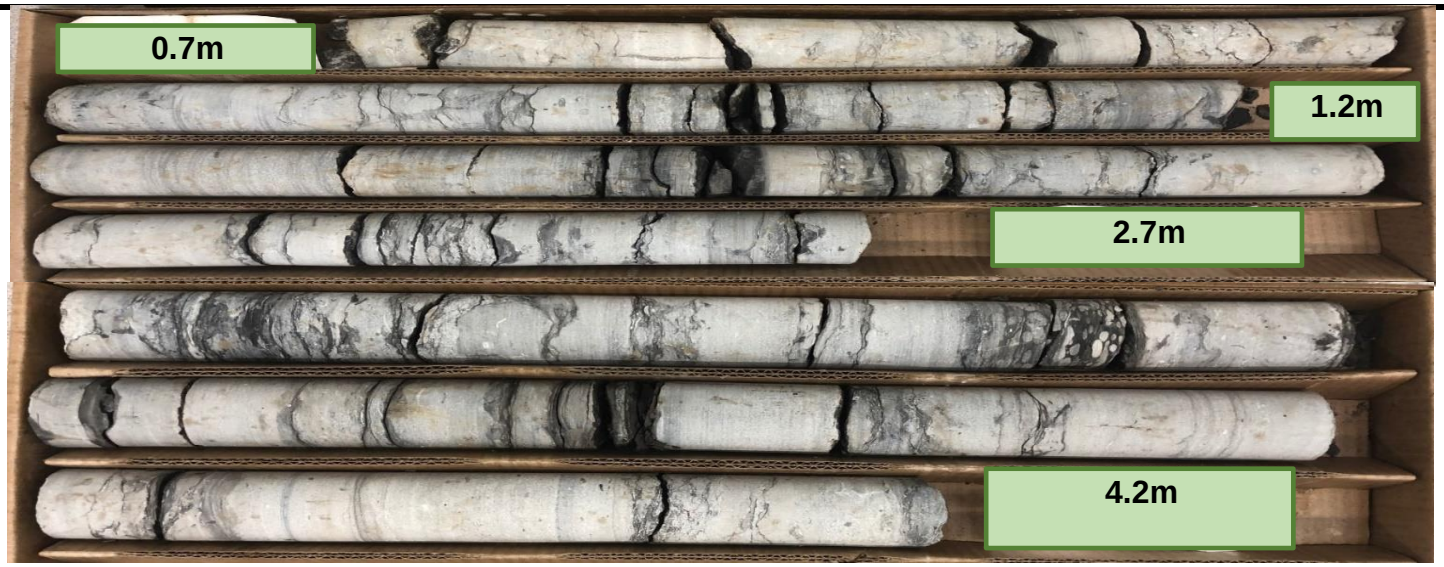
EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**Mr. Carmine Zayoun**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**December 9, 2020**	**Borehole No:**	**BH7**	**Sample:**	**SS3**	**Depth (m) :**	**1.5-2.1**		
Sample Composition :		**Gravel (%)**	**39**	**Sand (%)**	**50**	**Silt & Clay (%)**	**11**	**Figure :**	**62**
Sample Description :	**Glacial Till: Poorly Graded Sand with Silt and Gravel (SP-SM)**								

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

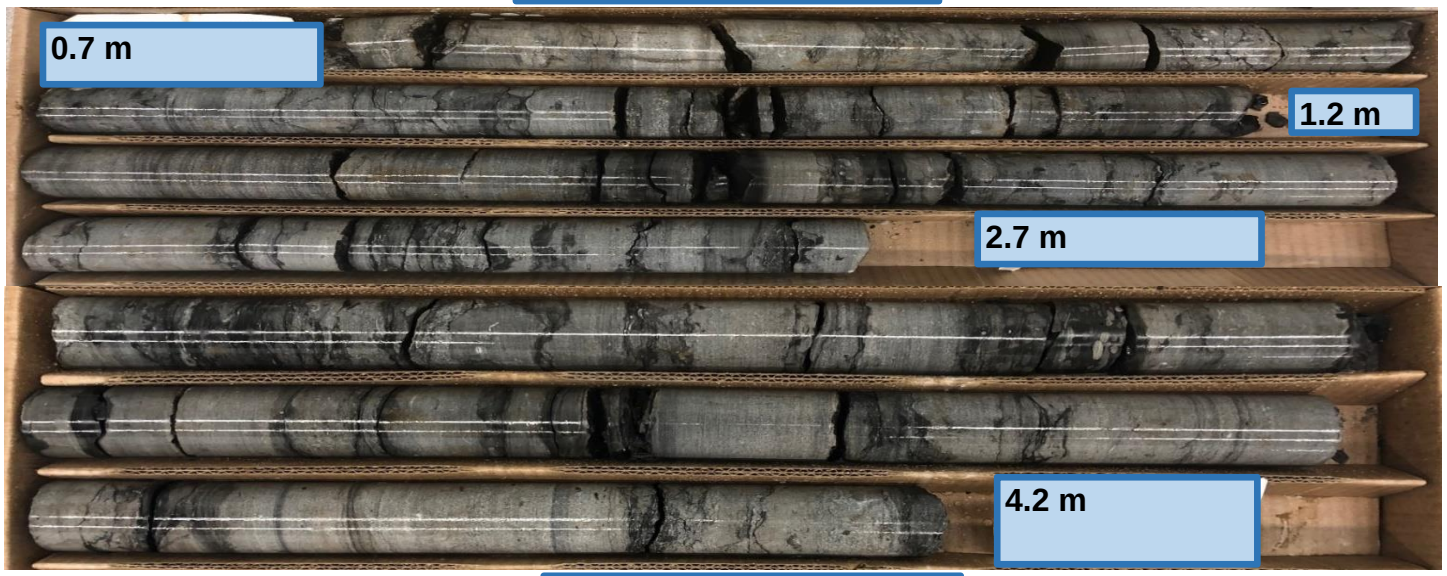
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-00258780-B0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development**						
Client :	**11654128 Canada Inc.**	**Project Location :**	**6171 Hazeldean Rd, Ottawa, ON**						
Date Sampled :	**December 9, 2020**	**Borehole No:**	**BH8**	**Sample No.:**	**SS5**	**Depth (m) :**	**3.0-3.6**		
Sample Description :		**% Silt and Clay**	**19**	**% Sand**	**38**	**% Gravel**	**43**	**Figure :**	**63**
Sample Description :		**Glacial Till: Silty Gravel with Sand (GM)**							

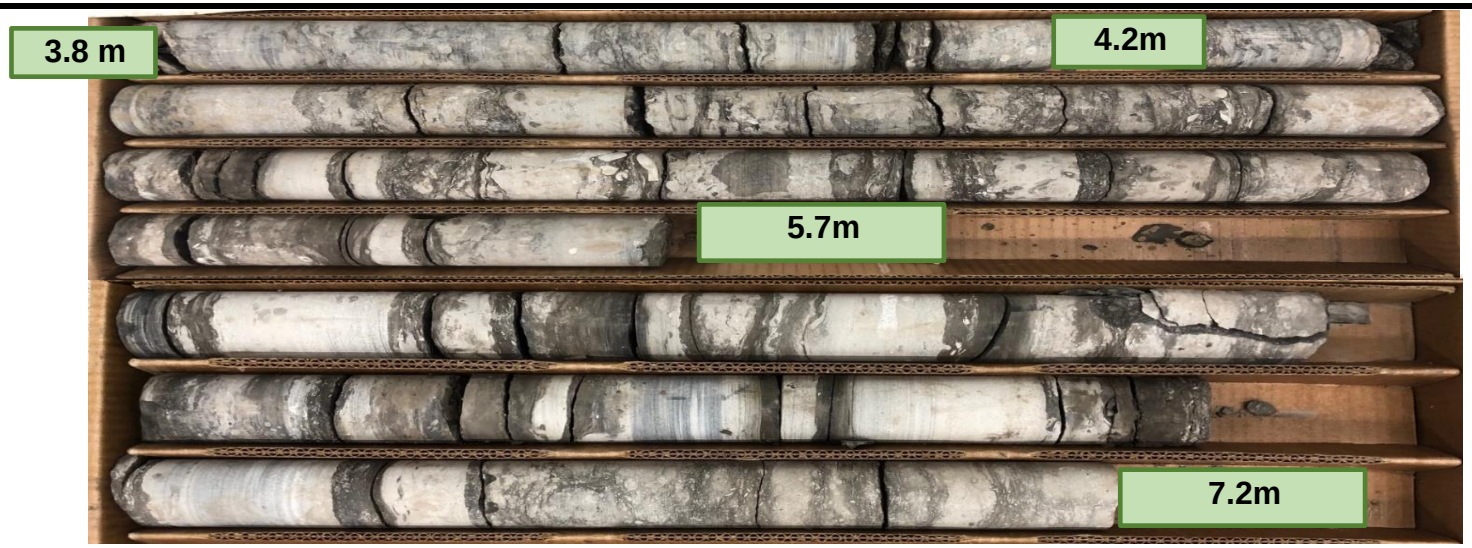


DRY BEDROCK CORES

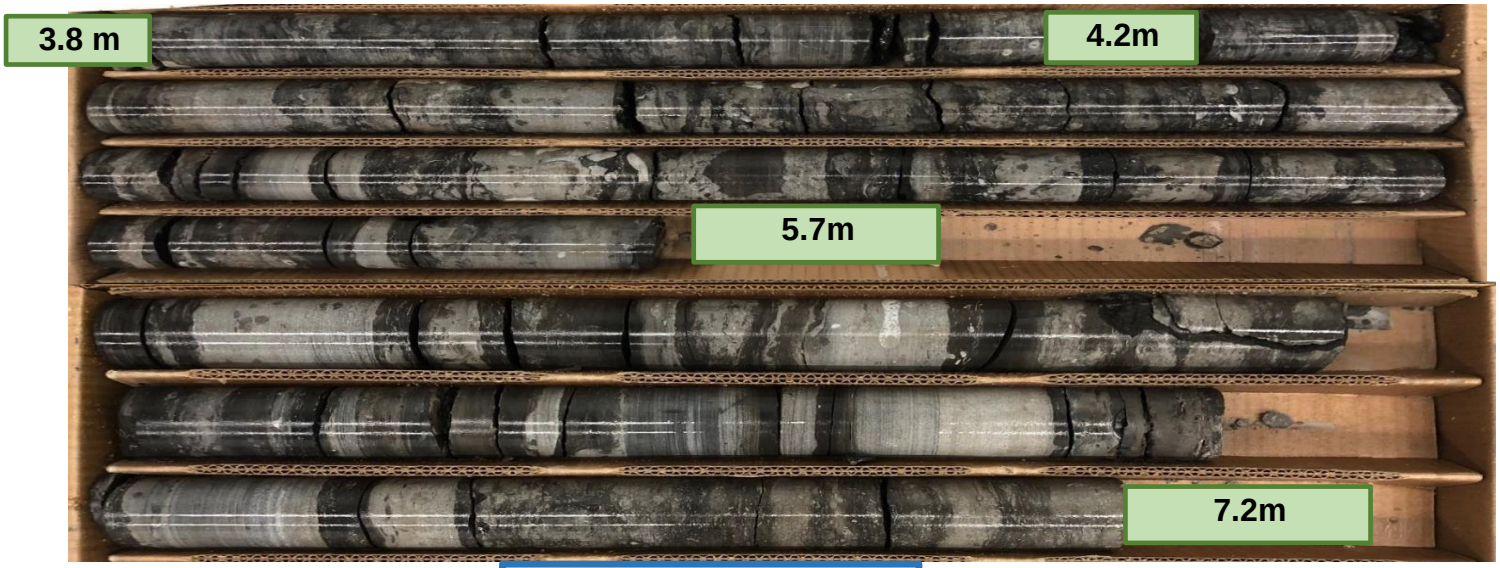


WET BEDROCK CORES

Borehole No. **BH-1**	**Core Runs** Run 1 : 0.7 - 1.2 m Run 2 : 1.2 - 2.7 m Run 3> 2.7 - 4.2 m	**Propsoed Residential Development** **6171 Hazeldean Road, Ottawa, ON**	Project No: **OTT-000258780-B0**
		ROCK CORE PHOTOGRAPHS	Figure No: **Fig 64**

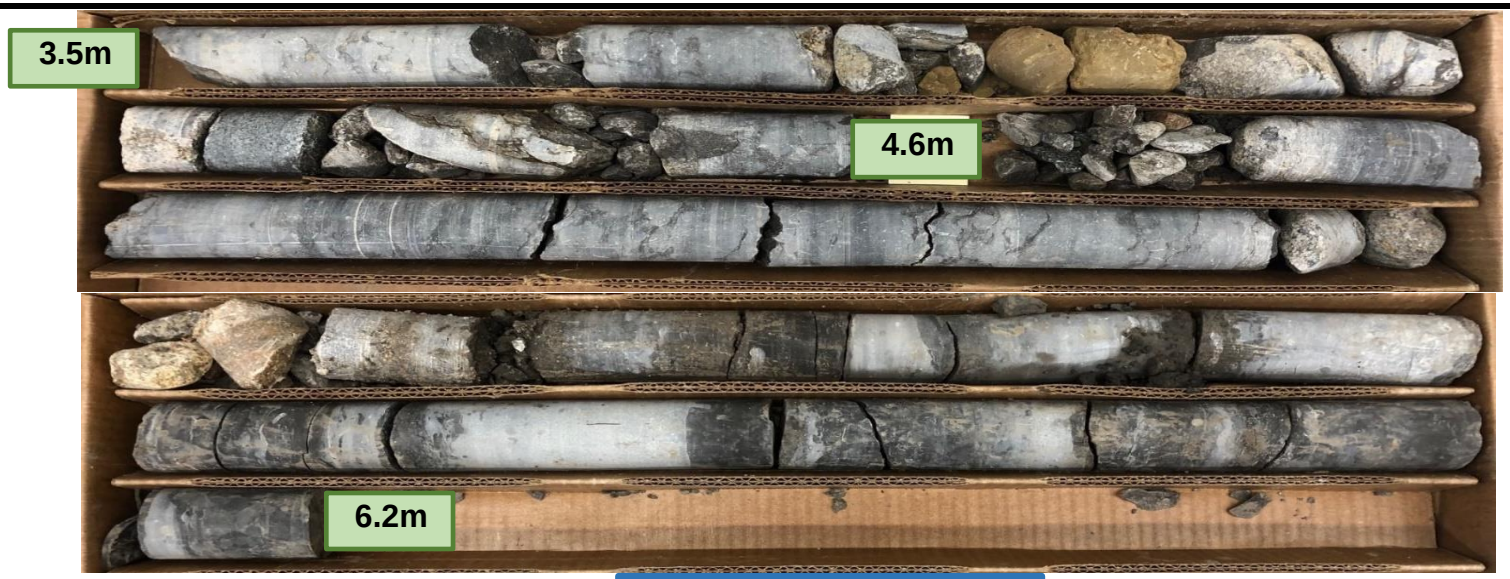


DRY BEDROCK CORES

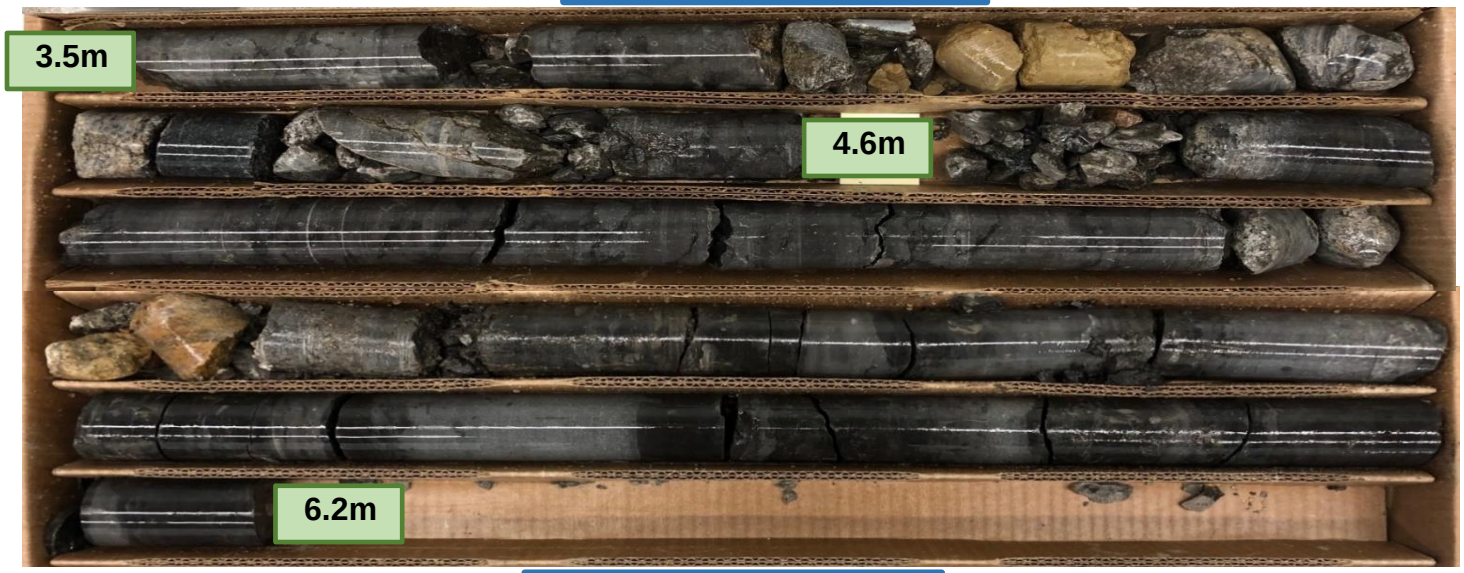


WET BEDROCK CORES

Borehole No. **BH-2**	**Core Runs** Run 1 : 3.8 - 4.2 m Run 2 : 4.2 - 5.7 m Run 3: 5.7 - 7.2 m	**Propsoed Residential Development** **6171 Hazeldean Road, Ottawa, ON**	Project No: **OTT-000258780-B0**
		ROCK CORE PHOTOGRAPHS	Figure No: **Fig 65**



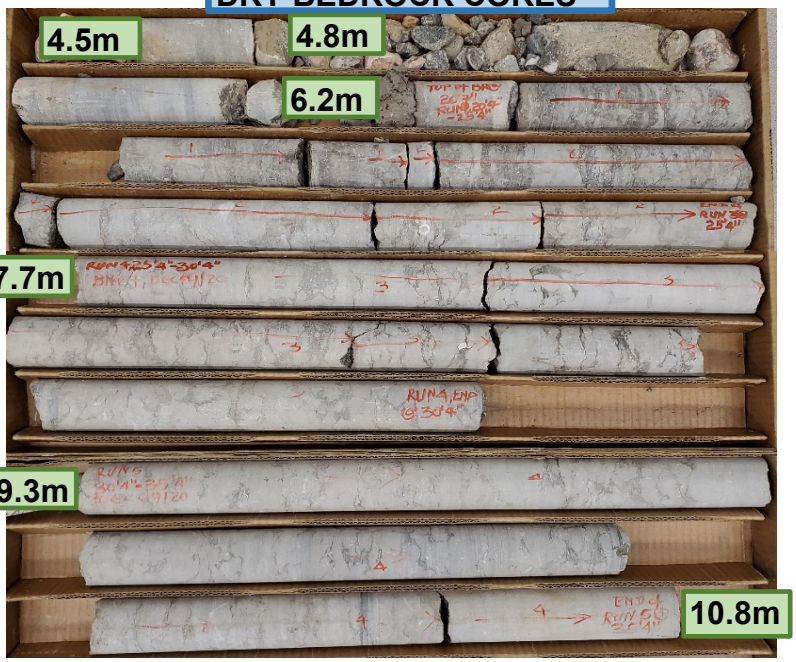
DRY BEDROCK CORES



WET BEDROCK CORES

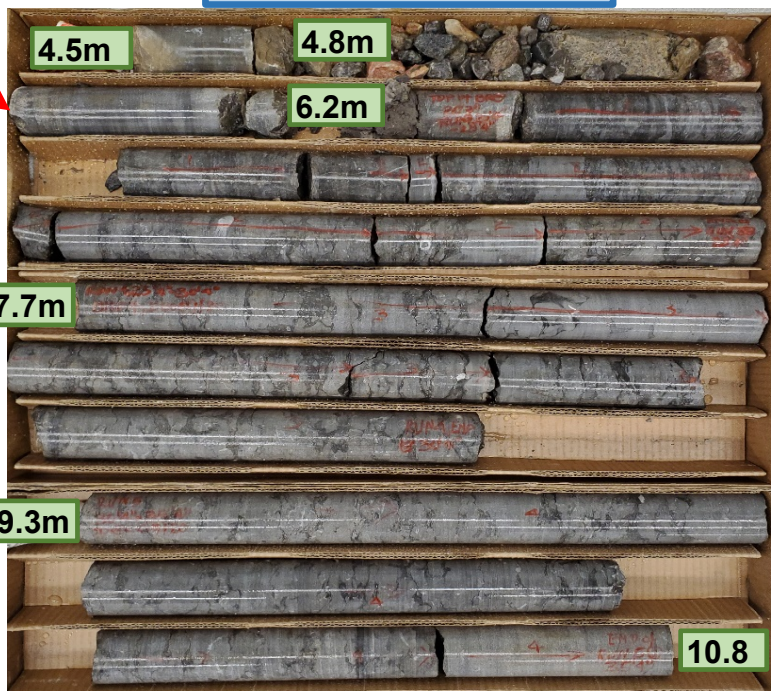
Borehole No. **BH-3**	**Core Runs** Run 3: 3.5 - 4.6 m Run 4: 4.6 - 6.2 m	**Propsoed Residential Development.** **6171 Hazeldean Road, Ottawa, ON**	Project No: **OTT-000258780-B0**
		ROCK CORE PHOTOGRAPHS	Figure No: **Fig 66**

DRY BEDROCK CORES



WET BEDROCK CORES

Start of Bedrock at 5.8 m Depth



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borehole no.	core runs	PROJECT	project no.
BH-7	Run 1: 4.5m - 4.8m Run 2: 4.8m - 6.2m Run 3: 6.2m - 7.7m Run 4: 7.7m - 9.3m Run 5: 9.3m - 10.8m	Proposed Residential Development 6171 Hazeldean Road	OTT-00258780-A0
date cored Dec 09, 2020		Rock Core Photographs	FIG 67

Appendix A: Test holes by Others

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

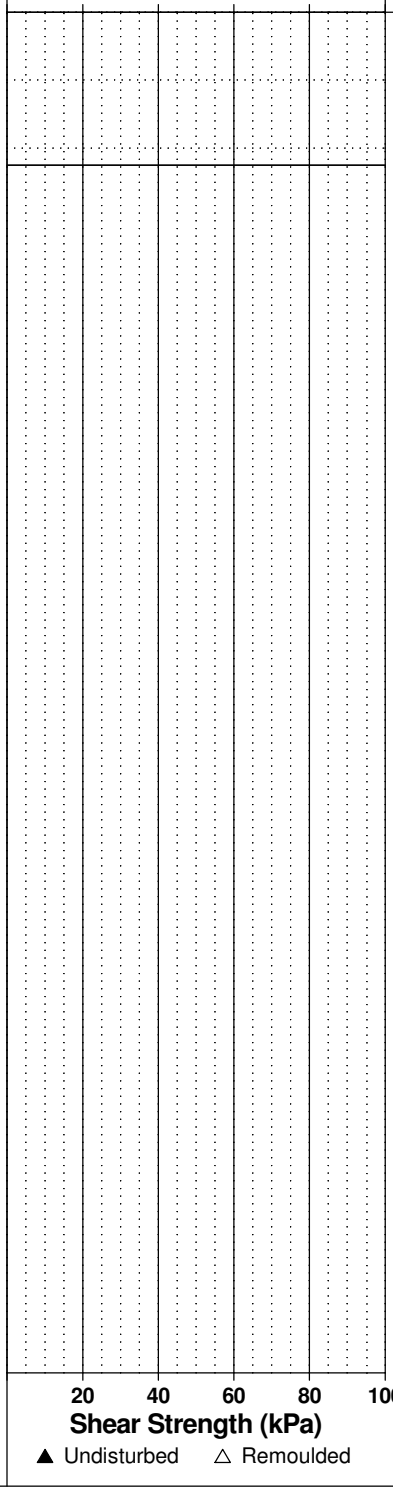
FILE NO. PG4917

REMARKS

HOLE NO. TP 7-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	118.03		
FILL: Brown silty sand, some gravel, cobbles and boulders, trace clay		G	1						
0.45									
End of Test Pit Practical refusal to excavation on inferred bedrock surface @ 0.45m depth (TP dry upon completion)									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP 8-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	116.07		
FILL: Brown silty sand, trace clay, gravel, cobbles and boulders		G	1			1	115.07		
		G	2			2	114.07		▽
2.20									
End of Test Pit Practical refusal to excavation at 2.20m depth (Groundwater infiltration at 2.0m depth)									

Pen. Resist. Blows/0.3m: ○ Water Content % — 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP 9-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.13		
BEDROCK: Weathered limestone 0.10		G	1						
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP10-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	116.63		
FILL: Brown silty sand, some gravel, cobbles and boulders, trace clay and organics		G	1			1	115.63		
		G	2			2	114.63		
3.00						3	113.63		
End of Test Pit									
(TP dry upon completion)									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP11-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	118.29		
FILL: Brown silty sand, some and gravel, occasional cobbles and boulders		G	1			1	117.29		▽
		G	2			2	116.29		
2.10									
End of Test Pit Practical refusal to excavation at 2.10m depth (Groundwater infiltration at 1.8m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP12-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	116.20		
FILL: Brown silty sand, trace gravel		G	1						
						1	115.20		
TOPSOIL 1.10		G	2						
GLACIAL TILL: Compact, brown silty sand, some gravel and cobbles, trace clay 1.30		G	3			2	114.20		
End of Test Pit 2.10									

Practical refusal to excavation on inferred bedrock surface at 2.10m depth

(TP dry upon completion)

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; scale 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP13-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.84		
FILL: Brown silty sand, some gravel, trace organics, cobbles and boulders		G	1						
						1	116.84		
1.20									
PEAT		G	2						▽
1.40									
GLACIAL TILL: Compact, brown silty sand, some gravel, trace clay		G	3						
2.00						2	115.84		
End of Test Pit									
Practical refusal to excavation on inferred bedrock surface at 2.00m depth									
(Groundwater infiltration at 1.4m depth)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP14-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	119.27		
FILL: Brown silty sand, some gravel, trace cobbles, boulders and organics		G	1			1	118.27		
		G	2			2	117.27		
2.20									
End of Test Pit Practical refusal to excavation at 2.20m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: ○ Water Content % — 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP15-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	119.09		
FILL: Brown silty sand, some gravel, cobbles and boulders, trace asphalt and wood		G	1			1	118.09		▽
1.70									
End of Test Pit Practical refusal to excavation at 1.70m depth (Groundwater infiltration at 1.6m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100; ▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP16-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	118.52		
FILL: Brown silty sand, some gravel, trace cobbles, boulders, concrete and organics		G	1						▽
						1	117.52		
End of Test Pit Practical refusal to excavation at 1.10m depth (Groundwater infiltration at 1.0m depth)						1.10			

Pen. Resist. Blows/0.3m: ○ Water Content % — 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP17-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	118.40		
FILL: Crushed stone, some silty sand		G	1						
0.20									
FILL: Brown silty sand, some gravel, trace clay		G	2			1	117.40		
1.50									
End of Test Pit Practical refusal to excavation at 1.50m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP18-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.78		
FILL: Brown silty sand, some gravel and cobbles		G	1						
						1	116.78		
1.40									
PEAT		G	2						
1.60									
MARL		G	3						
1.90									
Stiff, grey **CLAYEY SILT**		G	4			2	115.78	▲	
2.05									
GLACIAL TILL: Compact, grey silty sand, some gravel and cobbles		G	5						
						3	114.78		
3.00									
End of Test plt									
(TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP19-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	118.20		
FILL: Brown silty sand, some gravel, cobbles and boulders		G	1						▽
		G	2			1	117.20		
1.30									
PEAT									
1.70									
MARL		G	3			2	116.20		
2.00									
GLACIAL TILL: Compact, grey silty sand, some gravel, trace clay		G	4						
3.00						3	115.20		
End of Test Pit									
(Groundwater infiltration at 0.5m depth)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM TBM - Top spinde of fire hydrant located on the south side of Neil Avenue, near 1 Neil Avenue. Geodetic elevation = 114.69m.

FILE NO. PG4917

REMARKS

HOLE NO. TP20-19

BORINGS BY Backhoe **DATE** 2019 April 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	118.16		
FILL: Brown silty sand, some gravel and cobbles		G	1						
						1	117.16		
1.50									
PEAT		G	2						
1.80									
MARL									
2.00						2	116.16		
GLACIAL TILL: Compact, grey silty sand, trace clay and gravel		G	3						
3.00						3	115.16		
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

Shear Strength (kPa)
20 40 60 80 100
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 1-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	120.27
FILL: Topsoil with organics, trace gravel and cobbles 0.10		SS	1	29	20		
FILL: Brown silty sand with gravel, some cobbles, trace clay		SS	2	38	17	1	119.27
1.50							
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles, boulders, some clay		SS	3	47	50+	2	118.27
2.34		SS	4	0	50+		
End of Borehole							
Practical refusal to augering at 2.34m depth							
(BH dry upon completion based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 2-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	119.85
TOPSOIL 0.13		AU	1				
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders, some organics		SS	2	54	20	1	118.85
		SS	3	46	30	2	117.85
2.80		SS	4	40	26		
End of Borehole							
Practical refusal to augering at 2.80m depth							
(BH dry upon completion based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 3-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.10						0	118.03		
PEAT 0.20		AU	1						
GLACIAL TILL: Compact to very dense, brown silty sand with gravel, cobbles and boulders		SS	2	75	19	1	117.03		
		SS	3	50	50+				
2.01						2	116.03		
End of Borehole									
Practical refusal to augering at 2.01m depth									
(BH dry upon completion based on field observations)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 3A-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	118.50
FILL: Silty sand with gravel, some organics, wood 0.18		AU	1				
FILL: Brown to black silty sand with gravel 1.00		SS	2	54	17	1	117.50
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders, trace clay		SS	3	25	48	2	116.50
2.23							
End of Borehole							
Practical refusal to augering at 2.23m depth							
(BH dry upon completion based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 3B-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	118.70
FILL: Topsoil with organics, some gravel 0.13		AU	1				
FILL: Brown silty sand, some organics and gravel, trace wood		SS	2	54	11	1	117.70
1.37							
MARL		SS	3	17	W	2	116.70
2.13							
GLACIAL TILL: Brown silty sand with gravel, some cobbles, trace clay and peat		SS	4	21	4	3	115.70
		SS	5	29	28		
3.66							
End of Borehole							
Practical refusal to augering at 3.66m depth							
(GWL @ 2.3m depth based on field observations)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 4-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.02		
FILL: Brown silty sand with blast rock, gravel, boulders and cobbles		AU	1						
0.61									
End of Borehole Practical refusal to augering at 0.61m depth (BH dry upon completion based on field observations)									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 4A-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.00		
FILL: Brown silty sand with gravel, cobbles and boulders		AU	1						
		SS	2	46	30	1	116.00		
1.42									
End of Borehole Practical refusal to augering at 1.42m depth (BH dry upon completion based on field observations)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; scale 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. BH 4B-18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.00		
FILL: Brown silty sand with gravel, cobbles and boulders		AU	1						
		SS	2	100	50+				
0.94									
End of Borehole									
Practical refusal to augering at 0.94m depth									
(BH dry upon completion based on field observations)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone / ○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. TP 1-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	119.79
FILL: Topsoil, some sand and gravel							
0.30		G	1				
FILL: Brown silty sand with gravel, cobbles, boulders and organics							
- some ash and topsoil by 1.2m depth						1	118.79
- tire encountered at 1.2m depth		G	2				
1.80		G	3				
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders 1.90							
End of Test Pit							
Practical refusal to excavation on inferred bedrock at 1.90m depth							
(TP dry upon completion)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

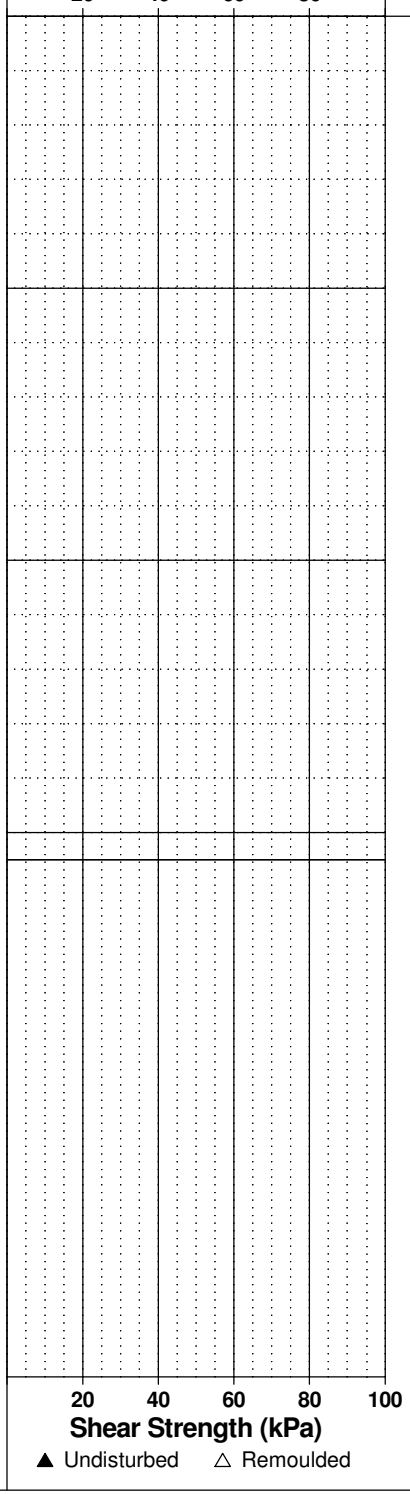
FILE NO. PG4706

REMARKS

HOLE NO. TP 2-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.20						0	120.36		
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders		G	1			1	119.36		
						2	118.36		
3.10						3	117.36		
End of Test Pit Practical refusal to excavation on inferred bedrock at 3.10m depth (TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. TP 3-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.60		
FILL: Brown silty sand with gravel, cobbles, boulders, topsoil and organics		G	1						
		G	2			1	116.60		
1.10									
TOPSOIL, some peat and roots		G	3						
1.30									
GLACIAL TILL: Compact to dense, grey silty sand with gravel, cobbles and boulders		G	4						
1.90									
End of Test Pit									
Practical refusal to excavation on inferred bedrock at 1.90m depth									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. TP 4-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	118.91
FILL: Topsoil with gravel and cobbles — 0.20							
FILL: Brown silty sand with gravel, cobbles and boulders, some organics		G	1				
— 1.00						1	117.91
FILL: Grey sandy silt with organics		G	2				
— 1.50							
PEAT		G	3				
— 2.10						2	116.91
MARL		G	4				
— 2.70							
Grey **SANDY SILT/SILTY SAND**		G	5				
— 3.10						3	115.91
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders — 3.40							
End of Test Pit							
Practical refusal to excavation on inferred bedrock at 3.40m depth							
(Groundwater infiltration at 3.1m depth)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

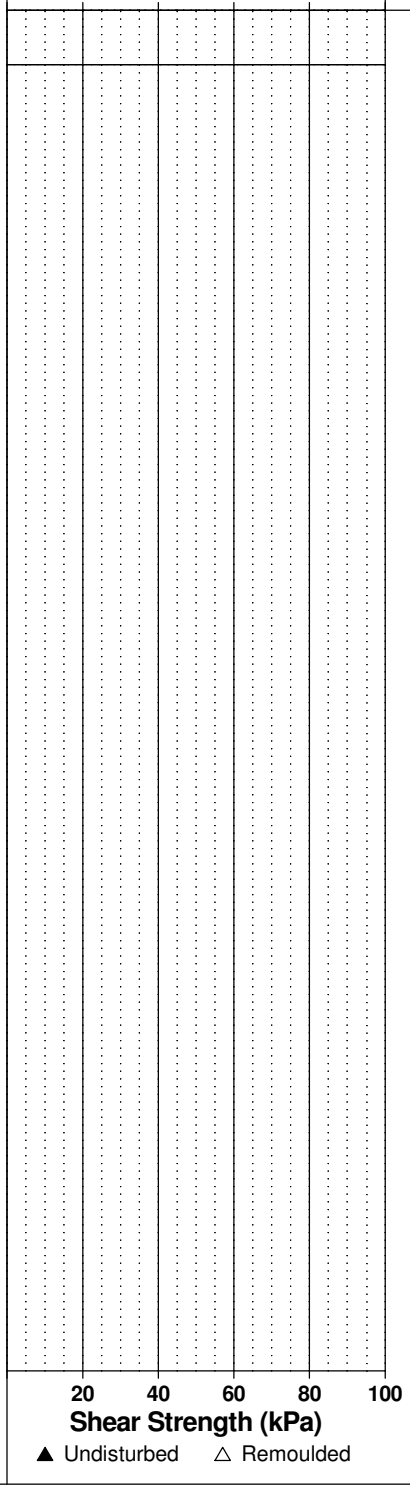
FILE NO. PG4706

REMARKS

HOLE NO. TP 5-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL with gravel, cobbles						0	117.12		
0.20									
End of Test Pit Practical refusal to excavation on inferred bedrock at 0.20m depth (TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. TP 5A-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL with gravel, cobbles						0	117.10		
0.20									
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders									
1.10						1	116.10		
End of Test Pit Practical refusal to excavation on inferred bedrock at 1.10m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. TP 6-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	116.70
FILL: Blast rock with gravel		G	1				
0.60							
FILL: Brown silty sand/sandy silt, some organics		G	2				
1.00						1	115.70
Asphalt		G	3				
1.30							
TOPSOIL		G	4				
1.60							
Fractured **BEDROCK** 1.70							
End of Test Pit							
Practical refusal to excavation on inferred bedrock at 1.70m depth							
(TP dry upon completion)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6171 Hazeldean Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4706

REMARKS

HOLE NO. TP 7-18

BORINGS BY Hydraulic Shovel **DATE** October 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	117.07		
FILL: Blast rock with sand, gravel and cobbles									
0.50									
FILL: Brown silty sand with gravel, cobbles, trace topsoil, organics		G	1			1	116.07		
1.20									
GLACIAL TILL: Brown silty sand with gravel, cobbles, boulders		G	2						
1.60									
Fractured **BEDROCK** 1.70									
End of Test Pit									
Practical refusal to excavation on inferred bedrock at 1.70m depth									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty sand with cobbles		G	1						
0.70						1			
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		G	2						
2.40						2			
End of Test Pit									
Practical refusal at 2.40m depth									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone 0.05									
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		G	1			1			
2.50						2			
End of Test Pit									
Practical refusal at 2.50m depth									

Photo Ionization Detector: ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
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REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Brown **SILTY SAND,** trace cobbles		G	1			0			
0.20									
GLACIAL TILL: Grey-brown silty sand with gravel, cobbles and boulders		G	2			1			
						2			
2.45									
End of Test Pit									
(Groundwater infiltration at 2.3m depth)									

Photo Ionization Detector: Lower Explosive Limit % — 20, 40, 60, 80

RKI Eagle Rdg. (ppm) — 100, 200, 300, 400, 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
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REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty sand, trace gravel		G	1						
0.40									
FILL: Brown silty sand with organics		G	2						
0.60									
FILL: Blast rock		G	3			1			
						2			
2.20									
End of Test Pit									
Test pit terminated on suspected bedrock surface @ 2.20m depth									
(Groundwater infiltration at 0.9m depth)									

Photo Ionization Detector: ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
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DATUM

REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone, trace sand									
0.50									
FILL: Organics with silty sand		G	1			1			
1.10									
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		G	2			2			
2.30									
End of Test Pit									
Test pit terminated on suspected bedrock @ 2.30m depth									
(Groundwater infiltration at 1.1m depth)									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
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DATUM

REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
FILL: Brown silty sand with gravel		G	1			1	
1.60							
PEAT: Dark brown/black organic matter		G	2			2	
2.80							
ORGANIC SILT/MARL		G	3			3	
3.10							
Grey **SILTY CLAY** with sand		G	4				
3.60							
End of Test Pit (Groundwater infiltration at 3.0m depth)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
Ottawa, Ontario

DATUM

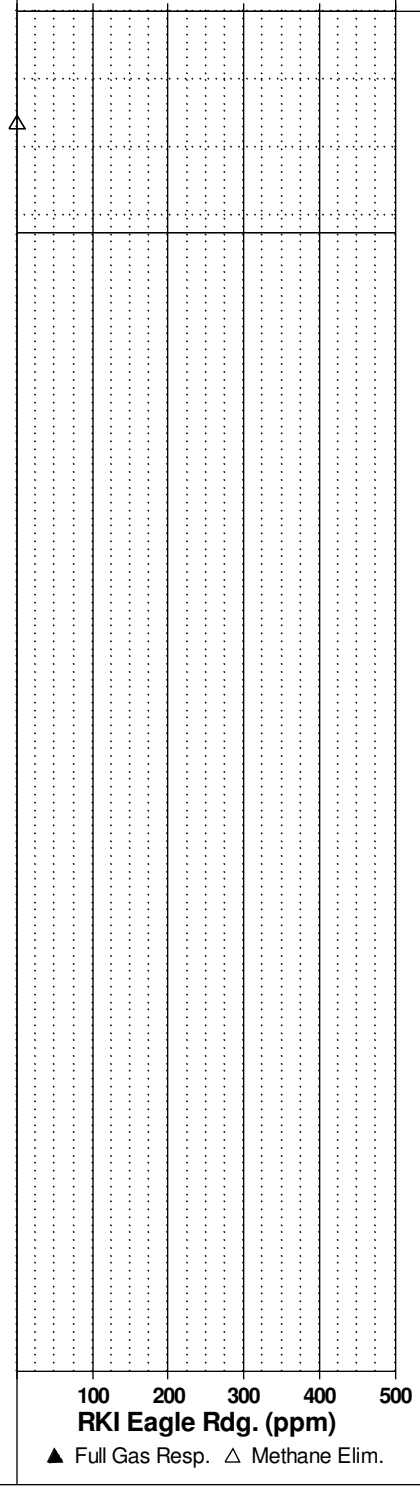
REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 7

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
Brown **SANDY SILT** with gravel		G	1						
0.65									
End of Test Pit									



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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
Ottawa, Ontario

DATUM

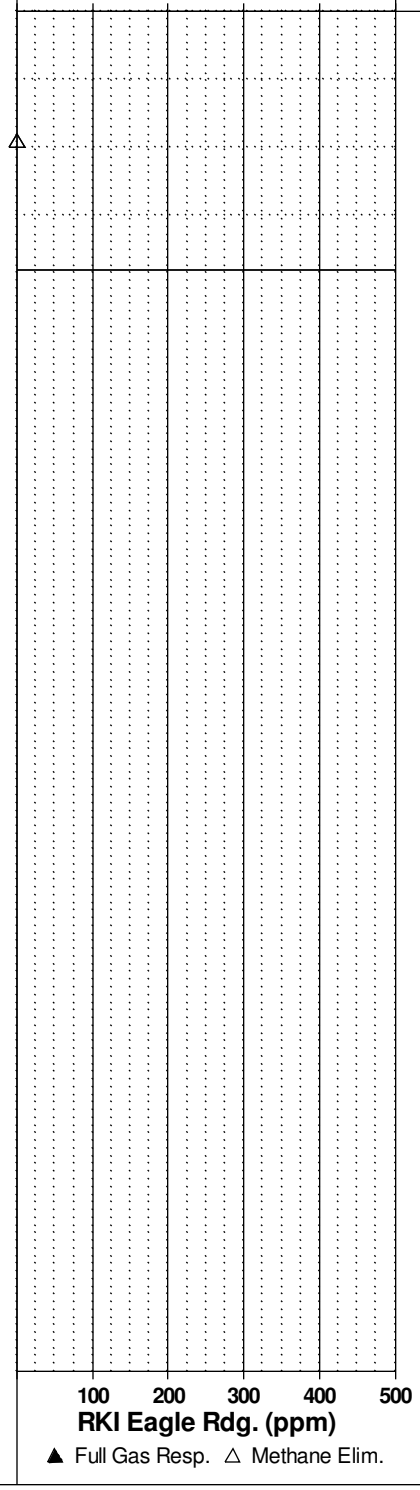
REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 8

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
Brown **SANDY SILT** with gravel		G	1						
0.76									
End of Test Pit									



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
6171 Hazeldean Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Backhoe **DATE** March 28, 2012

FILE NO. PE2548

HOLE NO. TP 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
FILL: Brown to grey silty sand with gravel, cobbles and boulders		G	1			1	
		G	2				
2.00						2	
PEAT		G	3				
2.30							
Grey **SANDY SILT,** trace gravel		G	4				
3.00						3	
End of Test Pit							
(Groundwater infiltration at 2.5m depth)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

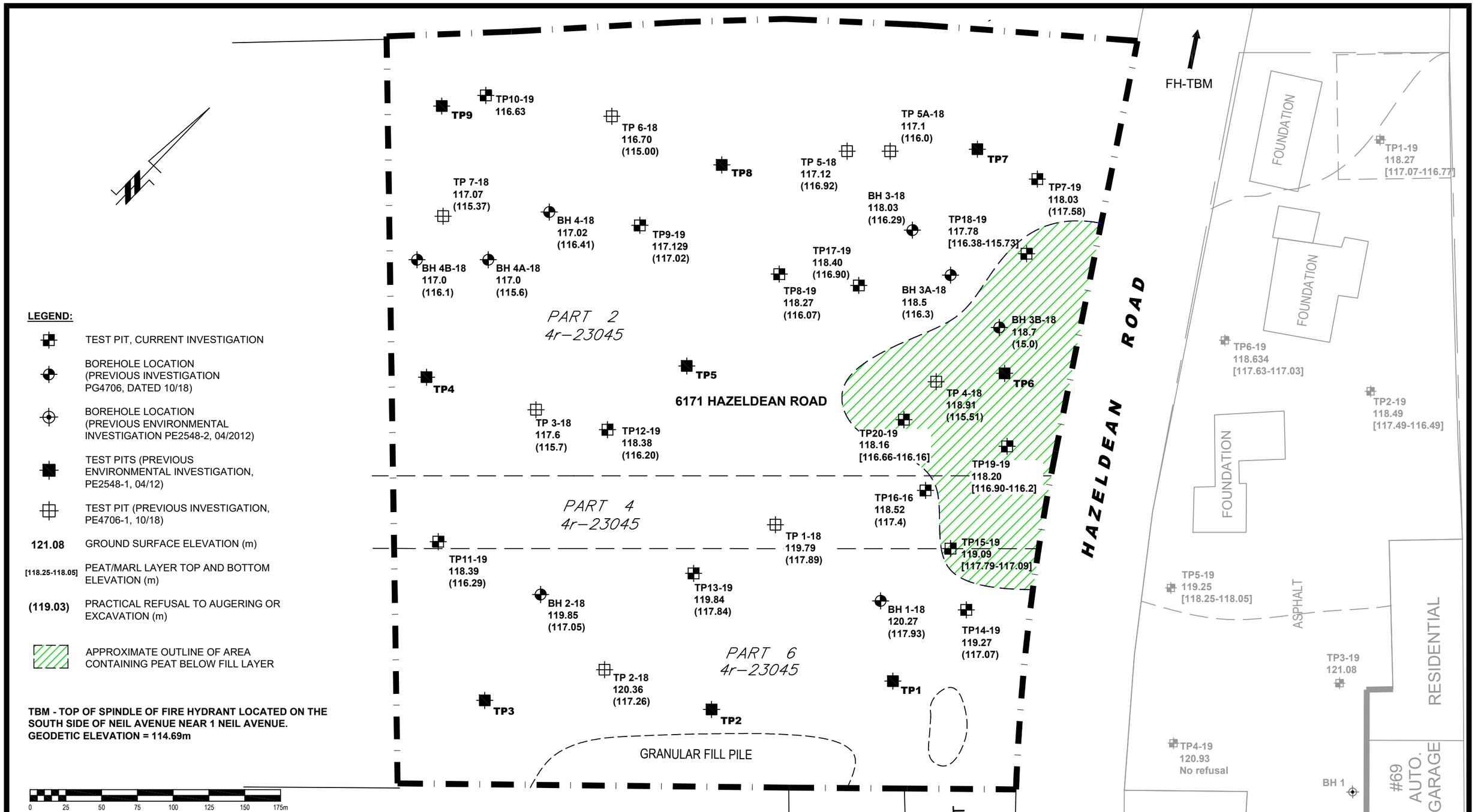
20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction



LEGEND:

- TEST PIT, CURRENT INVESTIGATION
- BOREHOLE LOCATION (PREVIOUS INVESTIGATION PG4706, DATED 10/18)
- BOREHOLE LOCATION (PREVIOUS ENVIRONMENTAL INVESTIGATION PE2548-2, 04/2012)
- TEST PITS (PREVIOUS ENVIRONMENTAL INVESTIGATION, PE2548-1, 04/12)
- TEST PIT (PREVIOUS INVESTIGATION, PE4706-1, 10/18)
- **121.08** GROUND SURFACE ELEVATION (m)
- [118.25-118.05] PEAT/MARL LAYER TOP AND BOTTOM ELEVATION (m)
- **(119.03)** PRACTICAL REFUSAL TO AUGERING OR EXCAVATION (m)
- APPROXIMATE OUTLINE OF AREA CONTAINING PEAT BELOW FILL LAYER

TBM - TOP OF SPINDLE OF FIRE HYDRANT LOCATED ON THE SOUTH SIDE OF NEIL AVENUE NEAR 1 NEIL AVENUE. GEODETIC ELEVATION = 114.69m

patersongroup
consulting engineers
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
0			

KAVANAGH FAMILY INVESTMENTS

GEOTECHNIAL INVESTIGATION
6171 HAZELDEAN ROAD

OTTAWA, **ONTARIO**

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1500	Date: 05/2018
Drawn by: YA	Report No.: PG4917-1
Checked by: DJG	Dwg. No.: **PG4917-1**
Approved by: DJG	Revision No.: 0

p:\autocad drawings\geotechnical\pg49xx\pg4917-1.dwg

Appendix B: Results of MASW Survey

GEOPHYSICS GPR INTERNATIONAL INC.

100 – 2545 Delorimier Street
Longueuil (Québec)
Canada J4K 3P7

Tel. : (450) 679-2400
Fax : (514) 521-4128
info@geophysicsgpr.com
www.geophysicsgpr.com

April 20th, 2021

Transmitted by email: ismail.taki@exp.com
Our Ref.: GPR-21-02866-b

Mr. Ismail Taki, M.Eng., P.Eng.
Manager, Geotechnical
exp Services inc.
100 – 2650 Queensview Drive
Ottawa ON K2B 8H6

Subject: **Shear Wave Velocity Sounding for the Site Class Determination**
75-81 Montreal Road, Ottawa (ON)

[Project: OTT-21001117-A0]

Dear Sir,

Geophysics GPR International inc. has been mandated by **exp** Services inc. to carry out seismic shear wave surveys on a property located at 75-81 Montreal Road, in Vanier, Ottawa (ON). The geophysical investigation used the Multi-channel Analysis of Surface Waves (MASW), the Spatial AutoCorrelation (SPAC), and the seismic refraction methods. From the subsequent results, the seismic shear wave velocity values were calculated for the soil and the rock, to determine the Site Class.

The surveys were carried out on April 9th, 2021, by Mrs. Karyne Faguy, B.Sc. geoph. 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 tables and graphs.

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 waves ("ground roll"). 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 dispersion properties are expressed as a change of phase 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, the corresponding spectrogram analysis and resulting 1D V_S model. The SPAC method allows deeper Vs soundings, but generally with a lower resolution for the surface portion. Its dispersion curve can then be merged with the one of higher frequency from the MASW to calculate a more complete inversion.

INTERPRETATION

The main processing sequence involved data inspection and edition when required; spectral analysis ("phase shift" for MASW, and "cross-correlation" for 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 of the order of 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 laid out along the parking spaces behind the building, with geophone spacing of 3 metres for the main spread, using 24 geophones (Figure 2). 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 seismograph Terraloc Pro 2 (from ABEM Instrument), and the geophones were 4.5 Hz. An 8 kg sledgehammer was used as the energy source with impacts being recorded off both ends of the seismic spreads.

The seismic records counted 4096 data, sampled at 1000 µs for the MASW surveys, and 50 µs for the seismic refraction. The records included a pre-trigged portion of 10 ms. 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 refraction (V_P), the rock depth was calculated between 6.2 and 7.2 metres (± 1 metre). The V_S for the upper portion of the rock was calculated at 2100 m/s. These results were used as initial parameters for the basic geophysical model, prior to the MASW dispersion curves modeling and inversions.

The MASW calculated V_S results are illustrated at Figure 5. Some very low to low seismic values were calculated from close to the surface to approximately 2.5 metres deep. A geotechnical assessment of the corresponding material should be produced for the potential of liquefaction, the degree of sensitivity of the clay, and other critical parameters.

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

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

(N: number of layers; H_i: thickness of layer "i" ; V_i: Vs 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 calculated $\overline{V}_{S30}$ value of the actual site is 804.1 m/s (cf. Table 1), corresponding to the Site Class "B". However, the Site Classes A and B are not to be used if there is 3 metres or more of unconsolidated materials between the rock surface and the bottom of the foundation. In the case there would be less than 3 metres of soil between the rock surface and the bottom of the foundation, the $\overline{V}_{S30}$* value would be 1621.9 m/s, allowing to use the Site Class "A" (cf. Table 2).

CONCLUSION

Geophysical surveys were carried out at 75-81 Montreal Road, in Vanier, Ottawa (ON), to identify the Site Class. The seismic surveys used the MASW and the SPAC analysis, and the seismic refraction method to calculate the $\overline{V}_{S30}$ value. Its calculation is presented at Table 1.

The $\overline{V}_{S30}$ value of the actual site is 804 m/s, corresponding to the Site Class "B" ($760 < \overline{V}_{S30} \leq 1500$ m/s), as determined through the MASW and SPAC methods, Table 4.1.8.4.A of the NBC, and the Building Code, O. Reg. 332/12. It must be noted that Site Classes A and B are not to be used if there is 3 metres or more of unconsolidated materials between the rock surface and the bottom of the spread footing or mat foundation. In the case there would be less than 3 metres of soil between the rock surface and the bottom of the foundation, the $\overline{V}_{S30}$* value would be 1622 m/s, allowing to use the Site Class "A" (cf. Table 2).

Some very low to low seismic values were calculated from approximately 0.5 to 2.5 metres deep. A geotechnical assessment of the corresponding materials could have to be produced for the potential of liquefaction and other critical parameters.

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. Table 4.1.8.4.A of the NBC) can supersede the Site classification 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.

Karyne Faguy, B.Sc.
Junior Project Manager

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

LICENSED PROFESSIONAL ENGINEER
J.-L. ARSENAULT
100148122
PROVINCE OF ONTARIO
2021-04-20

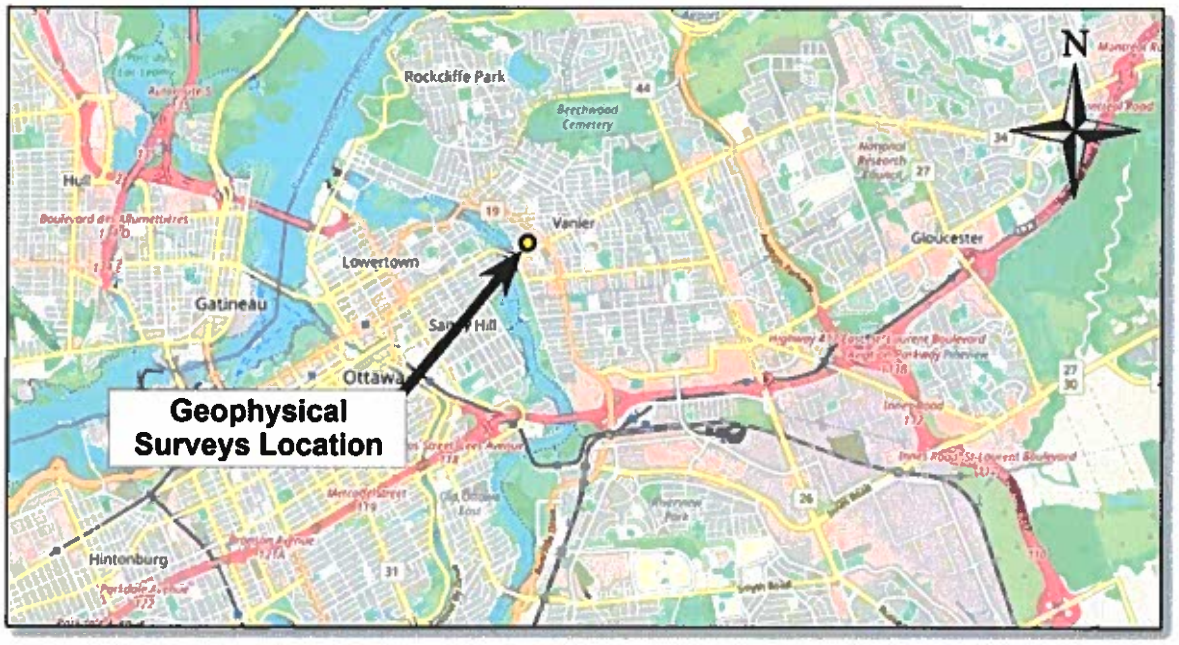


Figure 1: Regional location of the Site
(source: *OpenStreetMap©*)

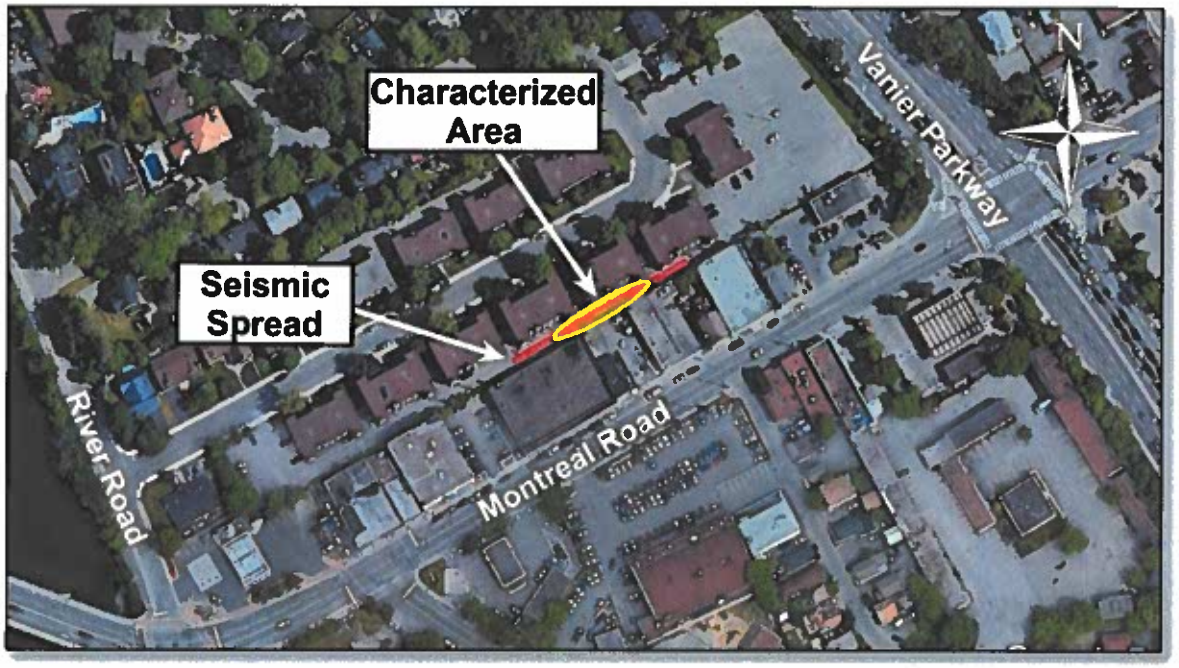


Figure 2: Location of the seismic spreads
(source: *Google Earth™*)

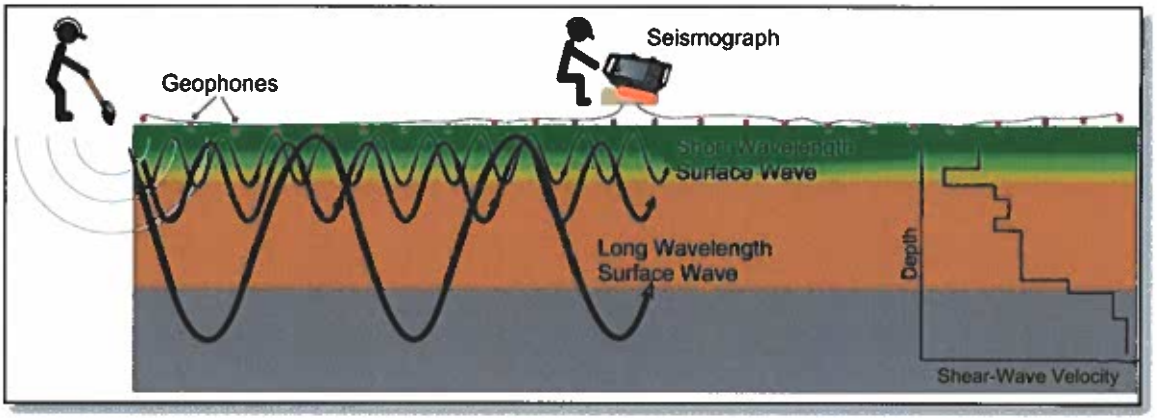


Figure 3: MASW Operating Principle

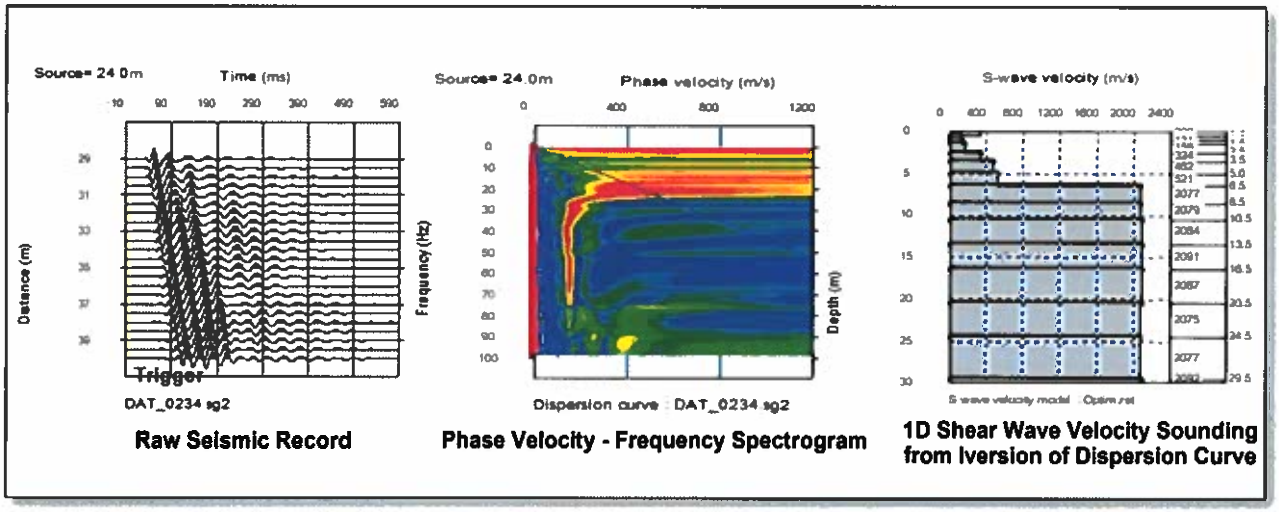


Figure 4: Example of a MASW/SPAC record, Phase Velocity - Frequency curve of the Rayleigh wave and resulting 1D Shear Wave Velocity Model

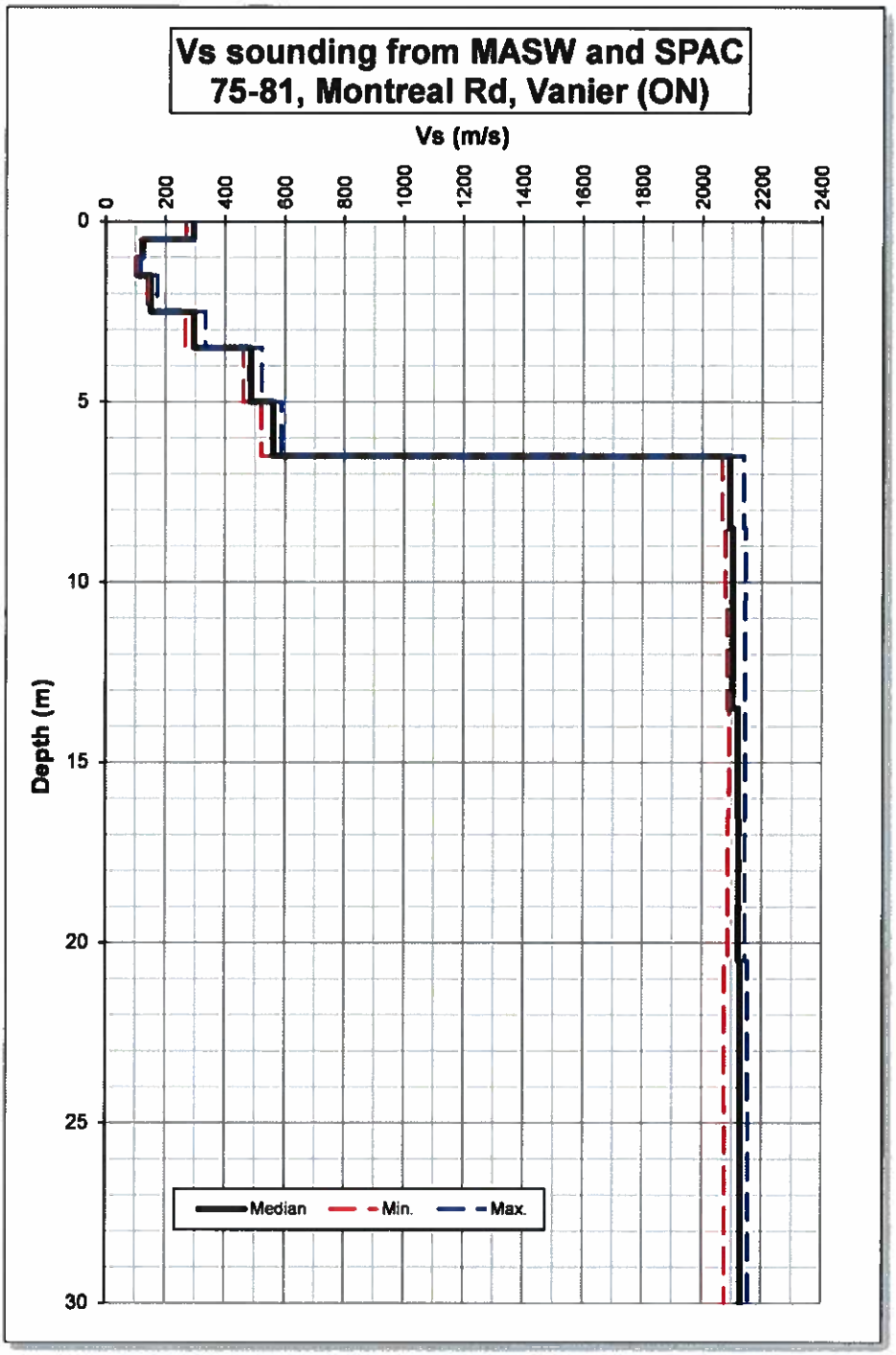


Figure 5: MASW Shear-Wave Velocity Sounding

TABLE 1
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	270.4	293.2	297.8	**Grade Level (April 9th, 2021)**				
0.50	**116.4**	**123.8**	**126.9**	0.50	0.50	0.001705	0.001705	293.2
1.00	**100.2**	**106.3**	**117.8**	0.50	1.00	0.004039	0.005744	174.1
1.50	**140.1**	**151.4**	**172.2**	0.50	1.50	0.004704	0.010448	143.6
2.50	266.9	295.2	333.7	1.00	2.50	0.006605	0.017053	146.6
3.50	462.2	485.1	522.8	1.00	3.50	0.003387	0.020440	171.2
5.00	521.9	560.0	587.4	1.50	5.00	0.003092	0.023532	212.5
6.50	2068.0	2092.3	2139.6	1.50	6.50	0.002679	0.026211	248.0
8.50	2078.9	2101.2	2145.4	2.00	8.50	0.000956	0.027167	312.9
10.50	2085.0	2101.2	2143.5	2.00	10.50	0.000952	0.028119	373.4
13.50	2091.0	2119.2	2144.9	3.00	13.50	0.001428	0.029546	456.9
16.50	2087.6	2122.6	2143.7	3.00	16.50	0.001416	0.030962	532.9
20.50	2075.6	2127.6	2152.6	4.00	20.50	0.001884	0.032846	624.1
24.50	2077.6	2129.6	2154.9	4.00	24.50	0.001880	0.034726	705.5
30				5.50	30.00	0.002583	0.037309	804.1

V_{S30} (m/s)	**804.1**
Class	**B** (1)

(1) The Site Classes A and B are not to be used if there is 3 metres or more of unconsolidated materials between the rock surface and the bottom of the spread footing or mat foundation.

TABLE 2
V_{S30}* Calculation for the Site Class (Less than 3 metres of unconsolidated material)

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)
(m)	(m/s)	(m/s)	(m/s)	**Less than 3 metres of unconsolidated material**				
0.00	270.4	293.2	297.8					
0.50	**116.4**	**123.8**	**126.9**					
1.00	**100.2**	**106.3**	**117.8**					
1.50	**140.1**	**151.4**	**172.2**					
2.50	266.9	295.2	333.7					
3.50	462.2	485.1	522.8					
3.51	462.2	485.1	522.8					
5.00	521.9	560.0	587.4	1.49	1.49	0.003071	0.003071	485.1
6.50	2068.0	2092.3	2139.6	1.50	2.99	0.002679	0.005750	520.0
8.50	2078.9	2101.2	2145.4	2.00	4.99	0.000956	0.006706	744.1
10.50	2085.0	2101.2	2143.5	2.00	6.99	0.000952	0.007658	912.8
13.50	2091.0	2119.2	2144.9	3.00	9.99	0.001428	0.009085	1099.6
16.50	2087.6	2122.6	2143.7	3.00	12.99	0.001416	0.010501	1237.0
20.50	2075.6	2127.6	2152.6	4.00	16.99	0.001884	0.012385	1371.8
24.50	2077.6	2129.6	2154.9	4.00	20.99	0.001880	0.014265	1471.4
33.51				9.01	30.00	0.004231	0.018496	1621.9

V_{S30}* (m/s)	**1621.9**
Class	**A**

Appendix C: Laboratory Certificate of Analysis

AGAT Laboratories

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

CLIENT NAME: EXP SERVICES INC
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899
ATTENTION TO: Ismail M. Taki
PROJECT: OTT-258780-B
AGAT WORK ORDER: 21Z699807
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: Jan 22, 2021
PAGES (INCLUDING COVER): 5
VERSION*: 1

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

Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
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AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 21Z699807

PROJECT: OTT-258780-B

CLIENT NAME: EXP SERVICES INC

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:6171 Hazeldean

SAMPLED BY:EXP

Inorganic Chemistry (Soil)

DATE RECEIVED: 2021-01-14 **DATE REPORTED: 2021-01-22**

		SAMPLE DESCRIPTION:		BH7 SS3 5'-7'	BH8 SS4 7. 5'-9.5'	BH9 SS2+3 2. 5'-7'
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2020-12-09	2020-12-09	2020-12-09
Parameter	Unit	G / S	RDL	1961104	1961105	1961106
Sulphate (2:1)	µg/g		2	38	47	103
Electrical Conductivity (2:1)	mS/cm		0.005	0.183	0.188	0.331
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.11	8.03	7.71

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

1961104-1961106 EC & Sulphate were determined on the 0.01M CaCl2 extract obtained from 2:1 leaching procedure (2 parts extraction fluid:1 part wet soil).

pH was determined on the 0.01M CaCl2 extract obtained from 2:1 leaching procedure (2 parts extraction fluid:1 part wet soil).

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 21Z699807

PROJECT: OTT-258780-B

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:6171 Hazeldean

SAMPLED BY:EXP

Soil Analysis

RPT Date: Jan 22, 2021			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
Sulphate (2:1)	1960540		41	41	0.9%	< 2	104%	70%	130%	106%	80%	120%	111%	70%	130%
Electrical Conductivity (2:1)	1960538		0.583	0.606	3.8%	< 0.005	103%	80%	120%						
pH, 2:1 CaCl2 Extraction	1961106	1961106	7.71	7.56	2.0%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.

Certified By:

AGAT Laboratories

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

Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 21Z699807

PROJECT: OTT-258780-B

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:6171 Hazeldean

SAMPLED BY:EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER

LT (Bagged ice) - 3.0 | 3.1 | 3.3

AGAT Laboratories

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

1LG BIK

Chain of Custody Record

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

Report Information:

Company: EXP Services
Contact: Ismail Taki
Address: 2650 Queensview drive Suite 100
Ottawa ON K2B 8H6
Phone: 613 688-1899 Fax:
Reports to be sent to:
1. Email: Ismail.Taki@exp.com
2. Email:

Project Information:

Project: OTT-258780-B
Site Location: 6171 Hazeldean
Sampled By: EXP
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

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

Regulatory Requirements:

(Please check all applicable boxes)

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

☐ Excess Soils R406
Table ____ (Indicate One)
☐ Regulation 558
☐ CCME

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

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

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

Sample Matrix Legend

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

Laboratory Use Only

Work Order #: 21Z699807
Cooler Quantity: One - 1401C
Arrival Temperatures: 19.6 | 19.6 | 19.7
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

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

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC (Y/N)	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	O. Reg 153: Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: PCBs	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	pH	Sulphide	Electro Conductivity	Potentially Hazardous or High Concentration (Y/N)
BH 7 SS 3 5'-7'	Dec 9/20	AM/PM	1															✓	✓	✓	
BH 8 SS 4 7.5'-9.5'	Dec 9/20	AM/PM	1															✓	✓	✓	
BH 9 SS 2+3 2.5'-7'	Dec 9/20	AM/PM	1															✓	✓	✓	
		AM/PM																			
		AM/PM																			
		AM/PM																			
		AM/PM																			
		AM/PM																			
		AM/PM																			
		AM/PM																			
		AM/PM																			

Samples Relinquished By (Print Name and Sign): Adolphe Hirwa	Date: Dec 14, 21	Time: 4:30pm	Samples Received By (Print Name and Sign): [illegible]	Date: 21/01/14	Time: 16h33
Samples Relinquished By (Print Name and Sign): [illegible]	Date: 21/01/15	Time: 16h00	Samples Received By (Print Name and Sign): SIMRAN	Date: Dec 8 Jan 16/21	Time: 11:15
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

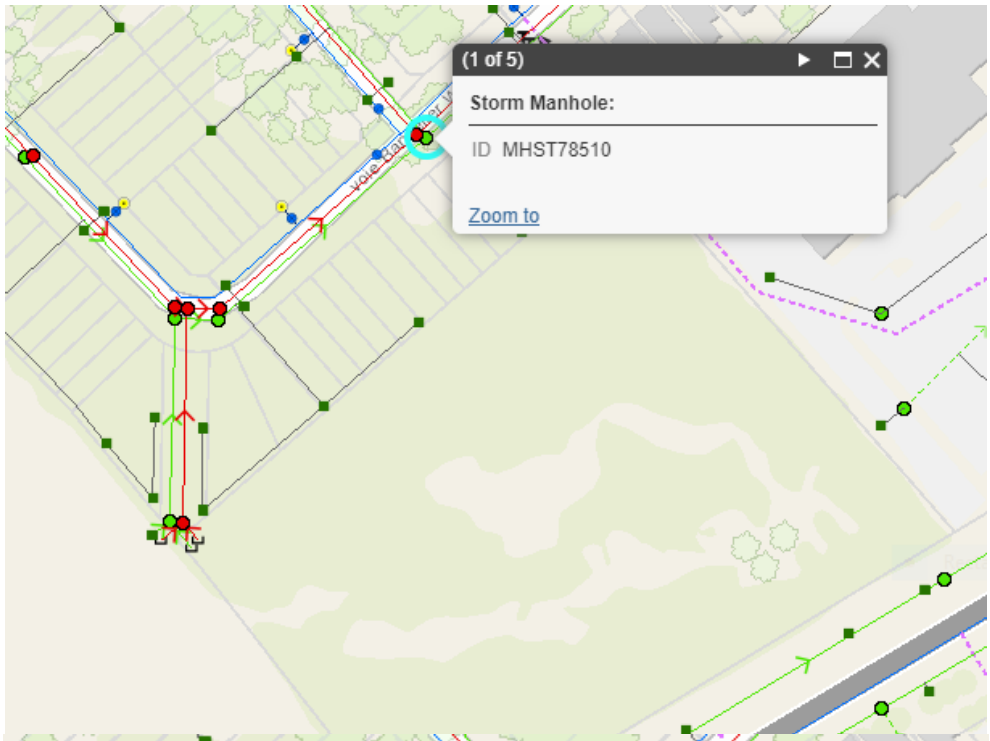
Page ____ of ____
No: T 111726

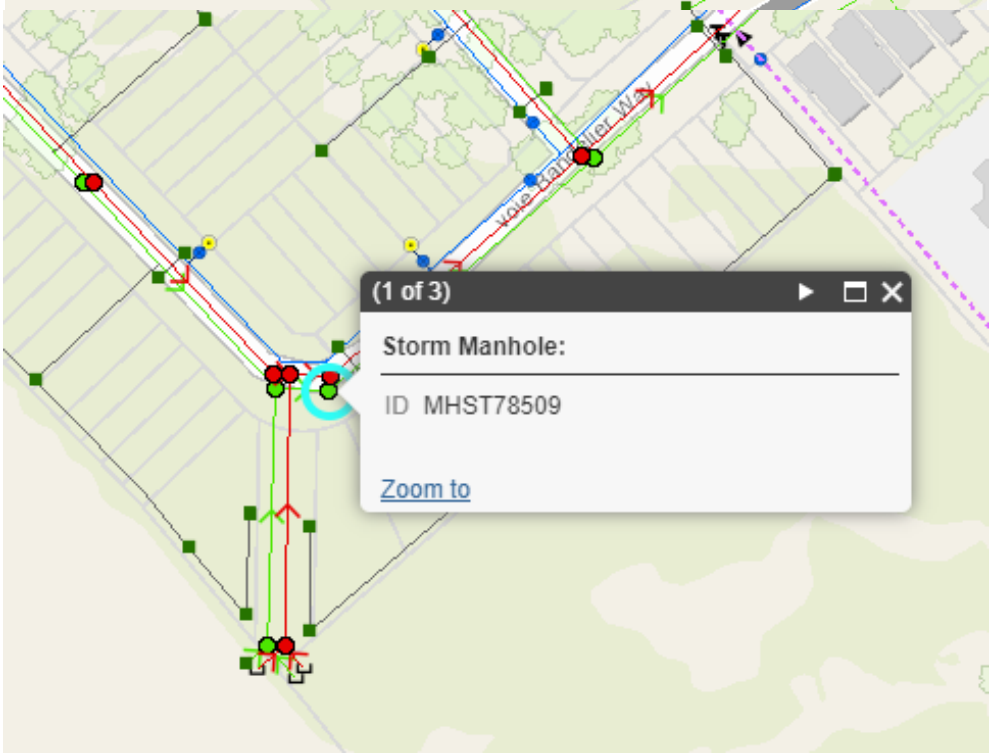
Document ID: DIV-78-1511.018

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

Date Issued: August 24, 2020

Appendix D: Outflow from SWP and Observation in Storm Sewer along Bandelier Way


(1 of 5)
Storm Manhole:
ID MHST78510
Zoom to


(1 of 3)
Storm Manhole:
ID MHST78509
Zoom to

List of Distribution

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