Geotechnical Investigation
Navan Road Subdivision Off-Site Servicing
Navan Road and Brian Coburn Boulevard
Ottawa, Ontario

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Type of Document:
FINAL

Project Number:
OTT-21004743-B0

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September 16, 2024

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Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed off-site servicing along Navan Road and Brian Coburn Boulevard for the proposed Navan subdivision to be situated at the civic address of 2983, 3053, and 3079 Navan Road in the City of Ottawa, Ontario (Figure 1). Authorization to proceed with this work was provided by 12714001 Canada Inc.

Off-site servicing plans completed by J.L. Richards (JLR) under JLR Project #29899-002, Drawing No. 4 for Navan Road and Drawing No. 7 for Brian Coburn Boulevard call for the construction of new services as follows;

- 200 mm diameter sanitary sewer and 600 mm to 1050 mm diameter storm sewer along a 300 m stretch of Navan Road from the Subdivision entrance (Paleo Drive) to the intersection of Renaud Road. The proposed inverts of the sanitary and storm sewer will be at Elevation 78.62 m to 79.26 m and 76.18 m to 77.88 m respectively. i.e. 2.6 m to 7.1 m below the existing pavement surface.
- 203 mm diameter watermain along 180 m of Brian Coburn Boulevard from the subdivision entrance (Paleo Drive) to the signalized pedestrian level crossing. The proposed invert of the watermain will be at Elevation 83.25 m to 83.53 m, i.e. 2.07 m to 2.46 m below the existing pavement surface.

The fieldwork for the geotechnical investigation was completed on June 10 to 12, 2024 and consists of drilling a total of eight (8) boreholes. i.e. Boreholes Nos. 6 to 8, 10, and 11 along Navan Road and Borehole Nos. 2 to 4 along Brian Coburn Boulevard to termination depths of 6.4 m and 6.7 m depths below the existing ground surface (elevation 79.3 m to 74.7 m). Borehole Nos. 1, 5, and 9 were not drilled due to locates or accessibility and proximity to locates. The fieldwork was supervised on a full-time basis by a representative of EXP.

The subsurface condition along the portion of Brian Coburn Boulevard under investigation comprised of 150 mm asphalt and 1050 mm of granular base/sub-base material underlain by subgrade fill of silty sand with clayey pockets.

The subsurface condition along the portion of Navan Road under investigation comprised of 110 mm to 230 mm asphalt and 500 mm to 900 mm of granular base/sub-base material underlain by subgrade fill of silty sand with gravel, clay pockets, and asphalt pieces.

The groundwater depth was recorded within the monitoring wells at 1.83 m to 1.97 m depth below grade (Elevation 83.84 m to 79.98 m). The groundwater table is subject to seasonal fluctuation and may be at a higher depth during wet weather conditions.

Excavations in the subsurface soils may be undertaken by large mechanical equipment.

It is recommended that a pre-construction condition survey of adjacent buildings, retaining walls, and underground services located in close proximity to the work area be undertaken prior to any earth work. In addition, vibration monitoring should be conducted within the influence zone of construction during construction operations.

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils on site are considered to be Type 3 and Type 4 on Bruce Coburn boulevard and Navan Road respectively. Excavation on site shall be undertaken as per the recommendations stated under the excavation section of the report.

Seepage of the surface and subsurface water into the excavations is anticipated and it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. In areas of high infiltration such as in zones of more permeable soils along the excavation side walls, a higher seepage rate should be anticipated and may require high-capacity pumps.

It is recommended that the bedding for the underground services including material specifications, thickness of cover material and compaction requirements conform to municipal requirements and/or Ontario Provincial Standard Specification and Drawings (OPSS and OPSD). Additional sub-base bedding will be required due to the soft nature of the clay subgrade as described in the pipe bedding section of the report.

It is anticipated that the majority of the material required for pipe bedding and backfilling purposes and construction of the new pavement structure would have to be imported and should preferably conform to OPSS Granular A and Granular B Type II for pipe bedding and pipe cover material, OPSS select subgrade material (SSM) for trench backfill above the pipe cover material and OPSS Granular A and B Type II for the construction of the base and sub-base of the new roadway pavement structure. Groundwater control must be implemented during the placement and compaction of the trench backfill material.

Clay seals should be installed in the service trenches at select intervals as required. The seals should be 1 m wide, extend over the entire trench width and from the bottom of the trench to the underside of the pavement structure. The silty clay should be compacted to 95 percent SPMDD. The purpose of the clay seals is to prevent the permanent lowering of the groundwater level.

The roadway pavement structure for Brian Coburn boulevard and Navan Road to be re-instated should match existing pavement and may consist of 200 mm thick asphaltic concrete (60 mm of SP12.5 Cat D, 2 lifts of 70 mm of SP19 Cat D), 150 mm thick of Granular A base, 900 mm thick of Granular B Type II material according to OPSS 1010 and compacted to 100 % of the SPMDD and laid overtop of competent subgrade. PG graded 64-34 is recommended for this site.

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

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the off-site servicing on Navan Road and Brian Coburn Boulevard for the proposed Navan subdivision to be constructed at the Civic address of 2983, 3053, and 3079 Navan Road in the City of Ottawa, Ontario (Figure 1). Authorization to proceed with this work was provided by 12714001 Canada Inc.

Off-site servicing plans completed by J.L. Richards (JLR) under JLR Project #29899-002, Drawing No. 4 for Navan Road and Drawing No. 7 for Brian Coburn Boulevard call for the construction of new services along these two roadways as described below;

- 200 mm diameter sanitary sewer and 600 mm to 1050 mm diameter storm sewer along a 300 m stretch of Navan Road from the Subdivision entrance (Paleo Drive) to the intersection of Renaud Road. The proposed inverts of the sanitary and storm sewer will be at Elevation 78.62 m to 79.26 m and 76.18 m to 77.88 m respectively. i.e. 2.6 m to 7.1 m below the existing pavement surface.
- 203 mm diameter watermain along 180 m of Brian Coburn Boulevard from the subdivision entrance (Paleo Drive) to the signalized pedestrian level crossing. The proposed invert of the watermain will be at Elevation 83.25 m to 83.53 m, i.e. 2.07 m to 2.46 m below the existing pavement surface.

This geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at a total of eight (8) boreholes located within the area of proposed work including three (3) along Brian Coburn Boulevard and five (5) along Navan Road,

b) Discuss excavation conditions and dewatering requirements during construction,

c) Provide pipe bedding requirements,

d) Comment on frost cover requirements,

e) Comment on watermain thrust blocks and joint restraints,

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

g) Discuss subsurface concrete and steel requirements; and

h) Recommend the pavement structure for the reconstruction of the roadway pavement.

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

2. Site Description

The site includes a section of Brian Coburn Boulevard stretching approximately 180 m from the Proposed Paleo Drive intersection to the existing signalized pedestrian level crossing coincidental with Pagé Road. The site also includes a section of Navan Road stretching approximately 300 m from the proposed Paleo Drive intersection to the existing intersection at Renaud Road. Both roads are two-lane arterial roads with heavy truck traffic within a residential area of the City of Ottawa.

Navan Road runs in the east-west direction and slopes gently downward from east to west towards the proposed subdivision with ground surface elevations at the borehole locations ranging from Elevation 82.87 m at the east end to Elevation 81.91 m at the west end. Brian Coburn Boulevard runs in a northeast-southwest direction and slopes gently downward away from the proposed subdivision with ground surface elevation at the borehole locations ranging from elevation 85.71 m to 85.56 m.

3. Procedure

The fieldwork for the geotechnical investigation was completed on June 10 to 12, 2024 and consists of eight (8) boreholes (Borehole Nos. BH2 to BH4, BH6 to BH8, BH10, and BH11) advanced to termination depths of 6.4 m and 6.7 m depths below the existing ground surface (Elevation 79.3 m to 74.7 m). Borehole Nos. BH1, BH5, and BH9 were not drilled due to locates conflict or accessibility. The fieldwork was supervised on a full-time basis by a representative of EXP.

The borehole locations were established on site by EXP. The borehole locations and geodetic elevations were surveyed by EXP and are shown on the Borehole Location Plan, Figures 2.3 to 2.5.

Prior to the fieldwork, the locations of the boreholes were cleared of any public and private underground services. In addition, a traffic management plan was submitted to the City of Ottawa for the purpose of acquiring a road cut permit.

The boreholes were advanced using a truck-mounted drill rig operated by a drilling specialist subcontracted to EXP. Standard penetration tests (SPTs) were performed in the boreholes from beneath the existing pavement surface at 0.6 m, 0.75 m, and 1.5 m intervals and the soil samples were retrieved by the split barrel sampler. Grab samples (GS) were retrieved from the granular fill underlying the asphalt in some of the boreholes. The undrained shear strength of cohesive soil was measured using the field vane and pocket penetrometer. During and upon completion of drilling, the groundwater condition was documented for each borehole. A 50 mm diameter monitoring well was installed in Borehole Nos. 2, 4, 6, and 10 according to EXP standard practice, and the details of the installations are provided in the respective borehole log.

Upon completion of drilling and installation of the monitoring wells, all boreholes were backfilled and patched at the roadway surface with ‘cold-patch’ asphalt.

All soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified. On completion of the fieldwork, all the soil samples were transported to the EXP laboratory in Ottawa, Ontario, and lab testing was selected. The laboratory testing program for the soil samples is as follows:

Natural Moisture Content……..68 tests
Grain Size Analysis……..4 tests
Atterberg Limits Determination……..2 tests
Chemical Analysis (pH, Sulphates, Chlorides, and Resistivity) ……..4 tests

4. Subsurface Conditions

A detailed description of the geotechnical conditions encountered in the boreholes is given on the borehole logs, Figures 3 to 10 inclusive. The borehole logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the locations where sampling was conducted. The passage of time may also result in changes in the conditions interpreted to exist at the locations where sampling was conducted.

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

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

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

4.1 Pavement Structure

A summary of the pavement structure measured in each borehole is shown in Table I for Brian Coburn Boulevard and Table II for Navan Road.

Table I: Summary of Existing Pavement Structure (Brian Coburn Boulevard)

Borehole No. (BH)	Asphaltic Concrete Thickness (mm)	Granular Base/Sub-base Thickness (mm)	Granular Base/Sub-base Fill Material	Subgrade Material
BH2	150	1050	Crushed Limestone	Silty sand with clay pockets (fill)
BH3	150	1050	Crushed Limestone	Silty clay with sand layers (fill)
BH4	150	1050	Crushed Limestone	Silty sand with gravel (fill)

Table II: Summary of Existing Pavement Structure (Navan Road)

Borehole No. (BH)	Asphaltic Concrete Thickness (mm)	Granular Base/Sub-base Thickness (mm)	Granular Base/Sub-base Fill Material	Subgrade Material
BH6	230	570	Crushed Limestone / RAP / Sand and Gravel	Buried Asphalt and silty sand with gravel, over buried topsoil

Table II: Summary of Existing Pavement Structure (Navan Road)				
Borehole No. (BH)	**Asphaltic Concrete Thickness (mm)**	**Granular Base/Sub-base Thickness (mm)**	**Granular Base/Sub-base Fill Material**	**Subgrade Material**
BH7	200	500	Crushed Limestone / RAP / Sand and Gravel	Buried Asphalt and sand and gravel fill, over silty sand with gravel and clay pockets (fill)
BH8	200	900	Crushed Limestone / Sand and Gravel / Silty Sand	Buried asphalt and silty sand and gravel over native silty clay
BH10	110	740	Crushed Limestone	Silty sand with clay pockets (fill)
BH11	120	700	Crushed Limestone	Silty sand with clay pockets (fill)

A review of Table I indicates that the existing pavement structure along the portion of Brian Coburn Boulevard under investigation comprised of 150 mm asphalt and 1050 mm of base/sub-base material. Table II indicates that the existing pavement structure along the portion of Navan Road under investigation comprised of 110 mm to 230 mm asphalt overlying 500 mm to 900 mm granular base. A buried asphalt layer and underlying granular was encountered in Borehole Nos. 6 to 8.

The granular base/sub-base material was crushed limestone along Brian Coburn Boulevard. Along Navan Road the granular base/subbase material varied including crushed limestone, recycled asphalt pavement (RAP), and sand and gravel. The granular base/sub-base is dense to very dense as indicated by Standard Penetration Test (SPT) "N"-values of 44 to 76. It's moisture content ranged between 2 and 5 percent.

A summary of the results from the grain-size analysis conducted on one sample of the granular base/sub-base material is shown in Table III and Figure 11.

Table III: Summary of Grain-size Analysis Test Results – Granular Base/Sub-base Samples					
Borehole No. – Sample No.	**Depth (m)**	**Grain-size Analysis (%)**			**Soil Classification (USCS)**
		Gravel	**Sand**	**Fines (Silt and Clay)**	
BH10 – GS1	0.2 - 0.8	35	46	19	Silty Sand with Gravel (SM)

Based on a review of Table III, the granular base/sub-base material may be classified as silty sand with gravel (SM) in accordance with the Unified Soil Classification System (USCS) and it may be classified as gravelly sand some silt according to the modified Burmister method (CFEM 2006).

4.2 Fill

The pavement structure in Borehole Nos. 2, 3, 4, 7, 10, and 11 is underlain by fill which extends to depths of 1.3 m to 2.6 m (Elevation 80.0 m to 84.0 m). The fill ranges from silty clay with sand pockets to silty sand with gravel and clay pockets and sometimes contains topsoil inclusions. The fill is loose to compact as indicated by the Standard Penetration Test (SPT) "N"-values of 6 to 21. The moisture content of the fill is 9 percent to 28 percent.

4.3 Buried Topsoil

The fill in Borehole No. 6 is underlain by 100 mm thick buried layer of topsoil that extends to 1.5 m depth (Elevation 80.4 m).

4.4 Buried Asphalt

A buried asphalt layer and underlying granular was encountered in Borehole Nos. 6 to 8 within the recorded granular base / subbase fill layer.

4.5 Silty Sand

The pavement structure and any topsoil and fill are underlain by native sand to silty sand at Borehole Nos. 6 and 7. The native sand to silty sand extends to depths of 1.8 m and 3.0 m (Elevation 80.1 m and 78.4 m). The SPT N-values range from 6 to 9 blows for 150 mm penetration indicating a loose state. The moisture content of the sand to silty sand is 23 percent to 33 percent.

A summary of the results from the grain-size analysis conducted on one selected sample of the native sand is shown in Table IV and Figure 12.

Table IV: Summary of Results from Grain-Size Analysis – Native Sand Sample

Borehole No. - Sample No.	Depth (m)	Grain-Size Analysis (%)				Soil Classification (USCS)
		Gravel	Sand	Silt	Clay	
BH7 – SS3	1.5 - 2.1	0	89	8	3	Poorly Graded Sand with Silt (SP-SM)

Based on the results of the grain size analysis, the native silty sand may be classified as poorly graded sand with silt (SP-SM) in accordance with the USCS, or sand trace silt and clay according to the modified Burmister Method (CFEM 2006).

4.6 Silty Clay

The pavement structure, any topsoil, fill, and native sand are underlain by native silty clay at all boreholes and extended to the maximum explored depths of 6.4 m to 6.7 m (Elevation 79.3 m to 74.7 m). The silty clay has an upper desiccated crust at all boreholes except Borehole No. 7 which extends to depths of 3.0 m to 4.9 m (elevation 81.6 m to 77.9 m). Shear vane tests completed in the crust resulted in undrained shear strengths of 82 kPa to 180 kPa indicating a stiff to very stiff consistency. The undrained shear strength in the lower grey silty clay ranged

between 19 kPa to 67 kPa indicating a soft to stiff consistency. The moisture content of the silty clay crust is 29 percent to 58 percent and the moisture content of the lower grey clay is 63 percent to 89 percent.

A summary of the results from the grain-size analysis conducted on two selected samples of the silty clay is shown in Table V and in Figures 13 and 14.

Table V: Summary of Results from Grain-Size Analysis – Native Silty Clay Samples

Borehole No. - Sample No.	Depth (m)	Grain-Size Analysis (%)				Atterberg Limits (% Moisture)				Soil Classification (USCS)
		Gravel	Sand	Silt	Clay	Water Content	Liquid Limit	Plastic Limit	Plasticity Index	
BH3 – SS4	2.3 - 2.9	0	2	41	57	42	62	20	42	Clay of High Plasticity (CH)
BH3 – SS7	5.3 – 5.9	0	0	26	74	72	62	22	40	Clay of High Plasticity (CH)

Based on the results of the grain size analysis, the silty clay may be classified as clay of high plasticity (CH) in accordance with the USCS, or silty clay, trace sand according to modified Burmister method (CFEM 2006).

4.7 Groundwater Level

Groundwater measurements taken in the monitoring wells installed in Borehole Nos. 2, 4, 6, and 10 on July 8, 2024, revealed groundwater levels to be at depths of 1.83 m to 1.97 m depth below grade (Elevation 83.84 m to 79.98 m), as shown in Table VI.

Table VI: Summary of Groundwater Measurements

Borehole No.	Surface Elevation, m	Screen Depth, m	Water Depth (Elevation), m	Date of Measurement (time elapsed, days)
BH2	85.70	3.1 – 6.1	1.86 (83.84)	July 8, 2024 (28)
BH4	85.59	3.1 – 6.1	1.96 (83.63)	July 8, 2024 (28)
BH6	81.91	4.6 – 6.1	1.83 (80.08)	July 8, 2024 (27)
BH10	81.95	4.6 – 6.1	1.97 (79.98)	July 8, 2024 (26)

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

5. Excavations and De-Watering Requirements

5.1 Excess Soil Management

Ontario Regulation 406/19 specifies protocols that are required for the management and disposal of excess soils. As set forth in the regulation, specific analytical testing protocols need to be implemented and followed based on the volume of soil to be managed and the requirements of the receiving site. The testing protocols are specific as to whether the soils are stockpiled or in situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. If excess soils are to be removed from site, excess soil sampling and testing would need to be completed depending on the requirements of the receiving site.

5.2 Excavations

Brian Coburn Boulevard

Excavations for the installation of the proposed watermain on Brian Coburn Boulevard will extend to depths of 2.3 m to 2.7 m into very stiff native silty clay crust, for pipe invert depths of 2.1 m to 2.5 m (Elevation 83.25 m to 83.53 m). The excavation will be below the perched water table in the soil which overlies the silty clay.

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91 and must extend to the surface clay. Based on the definitions provided in OHSA, the loose silty sand with gravel fill extending to 2.6 m depth (Elevation 83.0 m) at Borehole No. 4 is considered to be Type 3 soil and as such must be cut back at 1H:1V from the bottom of the excavation. Since this side slope likely cannot be achieved due to space restrictions on site, the excavation would have to be undertaken within the confines of a prefabricated support system such as a trench box, or an engineered support system designed in accordance with OHSA and the 2023 Fifth Edition of the Canadian Foundation Engineering Manual (CFEM).

It is also noted that in areas where the excavation is undertaken within the confines of a trench box, it is imperative that the space between the sides of the trench box and the excavation is backfilled with well compacted sand in order to prevent the clay from yielding.

Navan Road

It is understood that the sanitary and storm sewers will be installed in the same trench. Excavations for the installation of the proposed sanitary and storm sewers on Navan Road will extend below invert depths of 3.0 m to 4.2 m (Elevation 79.2 m to 78.6 m) for sanitary sewer and invert depths of 4.0 m to 6.5 m (Elevation 77.9 m to 76.8 m) for storm sewer. Excavations are expected to extend through the fill and native sand into the underlying clay. The excavations will extend below the groundwater level at all locations.

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. The excavation would have to be undertaken within the confines of a prefabricated support system such as a trench box, or an engineered support system designed in accordance with OHSA and the 2023 Fifth Edition of the Canadian Foundation Engineering Manual (CFEM).

As the excavation for the storm sewer will be relatively deep, unsupported open cut excavation is not recommended. Also, the silty clay below the excavation base is generally soft to firm except in the vicinity of Borehole No. 10 where it is stiff. The shear strength of the silty clay below the excavated base varies from 19 kPa to 62 kPa and in some cases decreases with depth. The potential of base heave of the excavation was examined. The factor of safety with respect to base heave was computed at borehole locations. The computed factor of safety varied from 1.6 at Borehole No. 11 and 1.5 at Borehole No. 8 to greater than 2 at other boreholes. It is noted that as the potential of base instability increases, the heave in the base of the excavation and movement surrounding the excavation also increases or factor of safety against base heave decreases. In the case of soft clays underlying the base of an excavation where the factor of safety is less than 2, substantial deformations may occur. Where the factor of safety is less than 1.5, the Canadian foundation engineering Manual recommends that the depth of penetration of the support system must extend below the base of the excavation. It is noted that the investigation was limited and that there may be other areas between borehole locations along the proposed storm sewer alignment where the factor of safety against base heave is close to or less than 1.5. It is therefore recommended that the excavation should be undertaken within the confines of a support system that extends below the base of the excavation to a sufficient depth to prevent excessive base disturbance, heave, and potential settlement of the existing services and structures in the area. The exception to this would be if a more detailed geotechnical investigation is undertaken by the construction contractor to delineate areas requiring the support system to extend below the excavation base from the areas not requiring extension of the support system below the excavation base.

Seepage of perched water from the sand and clay may infiltrate into the excavation. However, it should be possible to collect this water at low points in the trenches and to remove it by pumping.

General Comments on Excavation

Excavations in the subsurface soils may be undertaken by large mechanical equipment.

It is recommended that a pre-construction condition survey of adjacent buildings, retaining walls, and underground services located in close proximity to the work area be undertaken prior to any earth work. In addition, vibration monitoring should be conducted within the influence zone of construction during construction operations.

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

5.3 De-Watering Requirements

Seepage of the surface and subsurface water into the excavations is anticipated and it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. In areas of high infiltration such as in zones of more permeable soils along the excavation side walls, a higher seepage rate should be anticipated and may require high-capacity pumps.

The excavations for the proposed works will likely require groundwater removal from the site. For construction dewatering, an Environmental Activity and Sector Registry (EASR) approval may be obtained for water takings greater than 50 m^3 and less than 400 m^3 per day. If more than 400 m^3 per day of groundwater are generated for dewatering purposes, then a Category 3 Permit to Take Water (PTTW) must be obtained from the Ministry of the

Environment, Conservation and Parks (MECP). A Category 3 PTTW would require a complete hydrogeological assessment and would take at least 90 days for the MECP to process once the application is submitted.

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

6. Pipe Bedding Requirements

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

On Bruce Coburn Boulevard, the watermain pipe subgrade material will consist of very stiff silty clay. In this case, it is recommended the pipe bedding consist of 300 mm of OPSS Granular A. The bedding material should be compacted to at least 98 percent SPMDD.

On Navan Road, the sanitary sewer pipe subgrade material is anticipated to consist of very stiff silty clay or loose sand. The storm sewer pipe subgrade will consist of wet firm silty clay. The pipe bedding for the sanitary sewer may consist of 300 mm of OPSS granular A however the pipe bedding for the storm sewer should consist of 600 mm of OPSS Granular B Type II overlain by 150 mm thick of OPSS Granular A bedding material. The bedding materials should be compacted to at least 98 percent SPMDD. Depending on subgrade condition, a filter cloth may be required to be installed on the surface of the clay subgrade.

The bedding thickness may be further increased in areas where the silty clay to clay subgrade becomes disturbed or below the water table. Trench base stabilization techniques, such as removal of loose/soft material, placement of crushed stone sub-bedding (Granular B Type II) that is completely wrapped in a non-woven geotextile, may also be used if trench base disturbance becomes a problem in wet or soft areas. Groundwater control is imperative for the successful installation of the underground services.

Clay seals should be installed in the service trenches at select intervals as required. The seals should be 1 m wide, extend over the entire trench width and from the bottom of the trench to the underside of the pavement structure. The silty clay should be compacted to 95 percent SPMDD. The purpose of the clay seals is to prevent the permanent lowering of the groundwater level.

7. Frost Protection

The frost penetration depth in the Ottawa area is 1.8 m below grade. A minimum depth of soil cover should be 2.4 m below final grade. The design depth of the proposed watermain is between 2.1 m to 2.5 m depth below ground surface on Brian Coburn Boulevard. The design depth of the proposed sanitary and storm sewers on Navan Road are each greater than 3 m depth and up to a maximum of 6.5 m depth below ground surface. Where the available soil cover for the new underground services is less than the required, such as the watermain on Brian Coburn Boulevard, it is recommended that HI-50 extruded polystyrene rigid insulation be used and placed around the new underground service in accordance with OPSD 1109.030 or City of Ottawa standard drawing number S35.

8. Pre-Cast Maintenance Holes

Pre-cast structures such as maintenance holes should be installed in accordance with OPSS and OPSD. The subgrade for the pre-cast structures is anticipated to be soft to stiff silty clay. It is recommended that the bedding material consist of a minimum of 300 mm thick OPSS Granular A material compacted to 98 percent SPMDD. The bedding thickness may be further increased in areas where the silty clay to clay subgrade becomes disturbed or below the water table. Trench base stabilization techniques, such as removal of loose/soft material, placement of crushed stone sub-bedding (Granular B Type II) that is completely wrapped in a non-woven geotextile, may also be used if trench base disturbance becomes a problem in wet or soft areas.

Granular fill material should also be placed all around the maintenance hole to a minimum thickness of 300 mm.

9. Watermain Thrust Blocks

Thrust blocks or mechanical restraints for the proposed watermain may be designed and constructed in accordance with City of Ottawa specifications, drawings and special provisions. The new watermain is proposed along Brian Coburn Boulevard and installed to founding depths of 2.1 m to 2.5 m below existing grade (Elevation 83.53 m to 83.25 m). At the anticipated invert depths, the thrust blocks will be founded on stiff to very stiff silty clay crust. At the location of the pedestrian crossing, silty sand with gravel fill is present at the design invert elevation of the watermain. The fill is not suitable to support thrust blocks and should be removed to the native silty clay and replaced with granular B type II engineered fill compacted to 95% SPMDD. A bearing strength of 100 kPa at serviceability limit state (SLS) and 150 kPa at ultimate limit state (ULS) may be used for thrust blocks. The factored ULS value includes a resistance factor of 0.5. Thrust blocks may be designed in accordance with City of Ottawa Drawing W25.3 and W25.4. Mechanical restraints may be designed in accordance with City of Ottawa Drawing No. W25.6.

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

The on-site soils to be excavated will consist of asphalt and granular material from the existing pavement structure, fill composed of silty sand with clayey pockets and containing topsoil inclusions, native sand, and native silty clay.

From a geotechnical perspective, the existing granular fill and native sand free of organic soils and any debris from above the groundwater table may be re-used as trench backfill, subject to additional geotechnical testing at time of construction. The excavated silty clay is not considered suitable for re-use as trench backfill and should be discarded.

Material deemed suitable for re-use as backfill material from a geotechnical perspective will have to be checked to confirm that the material is suitable to remain on site from an environmental perspective.

It is anticipated that the majority of the material required for pipe bedding and backfilling purposes and construction of the new pavement structure would have to be imported and should preferably conform to OPSS Granular A and Granular B Type II for pipe bedding and pipe cover material, OPSS select subgrade material (SSM) for trench backfill above the pipe cover material and OPSS Granular A and B Type II for the construction of the base and sub-base of the new pavement structure. The trench backfill should be placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD. In area of high groundwater infiltration, the use of OPSS Granular B Type II may be required as trench backfill material and should be allowed for in the contract.

To minimize settlement of the pavement structure over the service trenches, the trench backfill within the frost zone to a 1.8 m depth below final grade should match the existing material along the trench walls to minimize differential frost heaving of the subgrade soil, provided the material is compactible. Otherwise, frost tapers may be required. Reference is made to OPSD 803.030 and 803.031 for frost treatment. Clay seals should be also provided as indicated in the previous sections of the report.

11. Subsurface Concrete and Steel Requirements

Chemical tests limited to chlorides, sulphates, pH, and electrical resistivity were performed on four (4) selected soil samples. The laboratory certificate of analysis is provided in the Appendix. The test results are summarized in Table VII below.

Table VII: Results of Chemical Tests on Selected Soil Samples

Borehole No. (Sample No.)	Depth (m)	Soil	pH	Sulphate (%)	Chloride (%)	Electrical Resistivity (ohm-cm)
BH2 – SS5 (Bruce Coburn Blvd)	3.0 – 3.6	Brown Silty Clay Crust	8.20	0.0086	0.0189	1960
BH4 – SS5 (Bruce Coburn Blvd)	3.8 – 4.4	Brown Silty Clay Crust	7.74	0.0148	0.0328	1150
BH7 – SS4 (Navan Road)	2.3 – 2.9	Grey Silty Sand	8.71	0.0131	0.0239	2110
BH11 – SS4 (Navan Road)	3.0 – 3.6	Grey Silty Clay	7.78	0.0103	0.0625	690

The results indicate a soil with a sulphate and chloride content of less than 0.02 percent and 0.063 percent respectively. These concentrations of sulphate and chloride would have a negligible potential of sulphate and chloride attack on subsurface concrete. The concrete should be in accordance with Table Nos. 3 and 6 of CSA A.23.1-14. However, the concrete should be dense, well compacted and cured.

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

12. Pavement Structure Re-Instatement

It is understood that the pavement in the sections of Navan Road and Brian Coburn Boulevard under consideration will have to be reinstated following the installation of services. Both sections of road are considered bus and truck routes with heavy traffic based on the city of Ottawa geobase. Average Annual Daily Traffic (AADT) was not provided for the subject roads.

The repaired pavement structure should at least match the existing pavement found along each section of road. The design was also checked with the Ministry of Transportation design manual. From the borehole information, the subgrade material is classified as Leda clay.

The recommended pavement structure is shown on Table VIII

Table VIII: Recommended Roadway Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Pavement Structure Thickness (mm) Brian Coburn Blvd	Pavement Structure Thickness (mm) Navan Road
Asphaltic Concrete (PG 64-34)	Minimum 92-98 percent MRD	60 mm – SP12.5 Cat D 70 mm SP19 Cat D 70 mm SP19 Cat D	60 mm – SP12.5 Cat D 70 mm – SP19 Cat D 70 mm – SP19 Cat D
Granular A Base (OPSS 1010)	100 percent SPMDD	150 mm	150 mm
Granular B Sub-base, Type II (OPSS.1010)	100 percent SPMDD	900 mm	900 mm
Subgrade, SSM (OPSS.1010)	Competent SSM trench backfill compacted to 95 percent SPMDD replaced		

NOTE:
1) SPMDD denotes Standard Proctor Maximum Dry Density ASTM-D698-12e2
2) MRD denotes Maximum Relative Density, ASTM D2041

Additional comments for the construction of the new roadway pavement structure are as follows:

1. As part of the subgrade preparation for the areas to be paved and after all the municipal underground services have been installed and service trenches properly backfilled and compacted, the surface of the subgrade should be properly shaped, crowned, then proofrolled with a heavy vibratory roller in the full-time presence of a representative of this office. Any soft or spongy or deleterious material detected at subgrade level should be sub excavated and properly replaced with OPSS 1010 SSM or Granular B Type II compacted to 95 percent SPMDD (ASTM D698).

2. The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. The need for adequate drainage cannot be over-

emphasized. Therefore, any subdrains that are removed or destroyed as part of the installation of services should be reinstated.

3. To minimize the problems of differential movement between the pavement and new catchbasins/manholes due to frost action, the backfill around the structures should consist of free-draining granular preferably conforming to OPSS 1010 Granular B Type II material. The backfill width should be stipulated to the dimensions of the sub-excavation for the new structures.

5. The granular materials used for pavement construction should conform to OPSS. 1010 for Granular A and Granular B Type II and should be compacted to 100 percent of the SPMDD (ASTM D698). The asphaltic concrete and its placement should meet OPSS requirements. In accordance with OPSS 310/313, the asphaltic concrete should be compacted to a minimum 92 percent of the maximum relative density in accordance with ASTM D2041.

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

13. General Comments

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

The information contained in this report is not intended to reflect environmental aspects of the soil and groundwater. Should determination of environmental aspects of the on-site soil and groundwater be required, additional sampling and testing would be necessary.

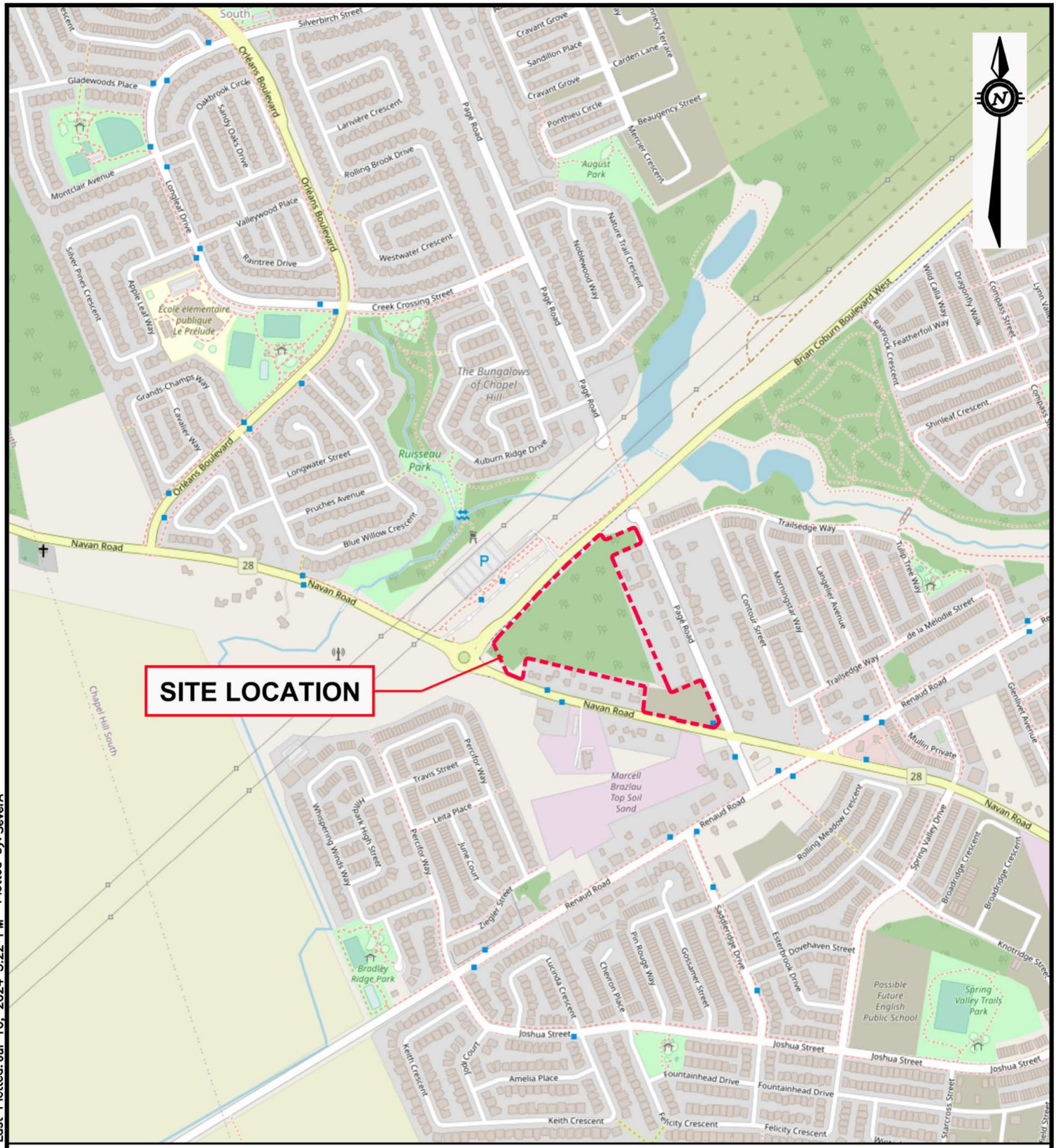
We trust that this information is satisfactory for your purposes. Should you have any questions, please contact this office.

Sincerely,

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

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

Figures



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DATE	JULY 2024
FILE NO	OTT-21004743-B0

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
2983, 3053 & 3079 NAVAN ROAD, OTTAWA, ON

SITE LOCATION PLAN

SCALE 1:10,000

SKETCH NO FIG 1

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BRIAN COBURN BLVD.
(SEE FIGURE 2.2)

PROPERTY BOUNDARY

BH/MW24-2

BH/MW24-4

BH24-3

BH24-11

BH/MW24-10

BH24-8

BH24-7

BH/MW24-6

35.6m

63.5m

49.4m

124.6m

43.5m

50.1m

NAVAN RD.
(SEE FIGURE 2.3)

rue Contour St.

ch. Page Rd.

rue Pizzicato St.

LEGEND

BH/MW24-2 — BOREHOLE / MONITORING WELL NO. AND LOCATION

NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. ASPHALT QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE BOREHOLE LOCATIONS.
4. BOREHOLE ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.
6. BASE OVERALL SERVICING PLAN OBTAINED FROM: *J.L.RICHARDS*, PROJECT #: 29899-002, DWG. #: OS, DATED 16/02/2024

0 20m 40m 80m
HORIZONTAL 1:2000

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FILE NO	OTT-21004743-B0

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
2983, 3053 & 3079 NAVAN ROAD, OTTAWA, ON

BOREHOLE LOCATION PLAN (SERVICING PLAN)

SCALE 1:2,000
SKETCH NO FIG 2.1

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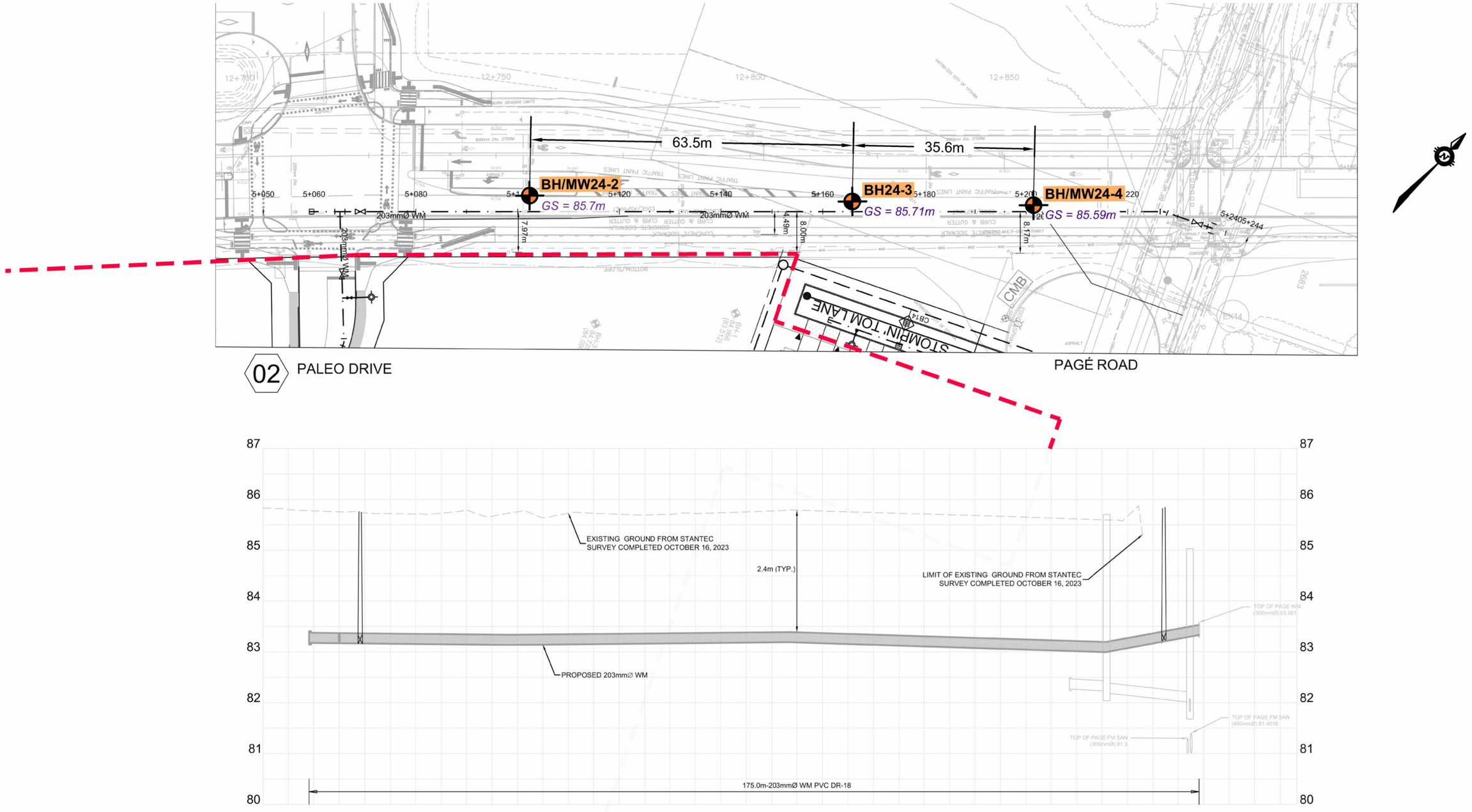

LEGEND

- PROPERTY BOUNDARY
- **BH/MW24-2** — BOREHOLE / MONITORING WELL NO. AND LOCATION
- *GS = 85.7m* — GROUND SURFACE ELEVATION (Meters)

0 5m 10m 30m
HORIZONTAL 1:750

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FILE NO	OTT-21004743-B0

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
2983, 3053 & 3079 NAVAN ROAD, OTTAWA, ON

BOREHOLE LOCATION PLAN (BRIAN COBURN BLVD.)

SCALE 1:750
SKETCH NO FIG 2.2

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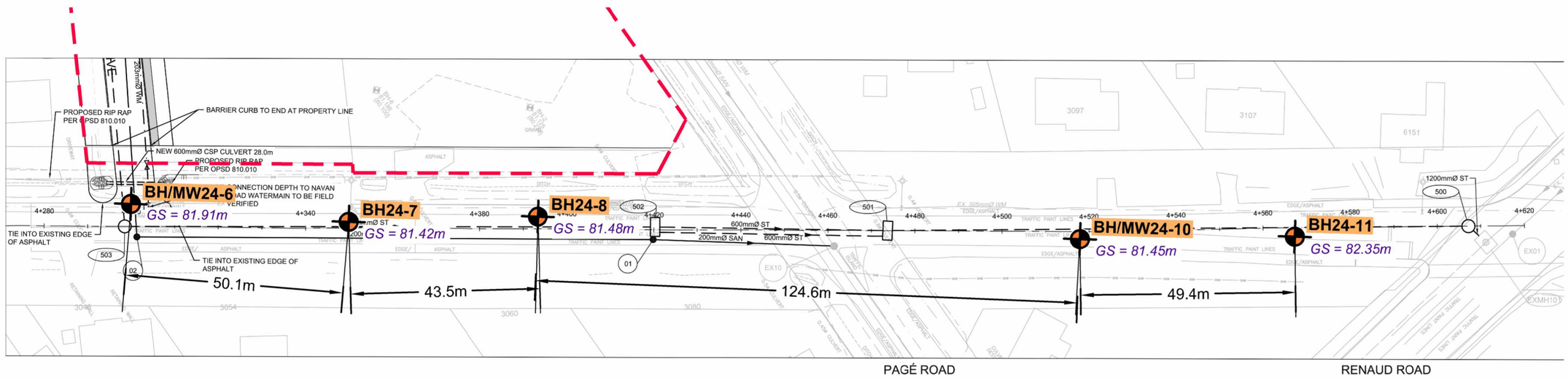

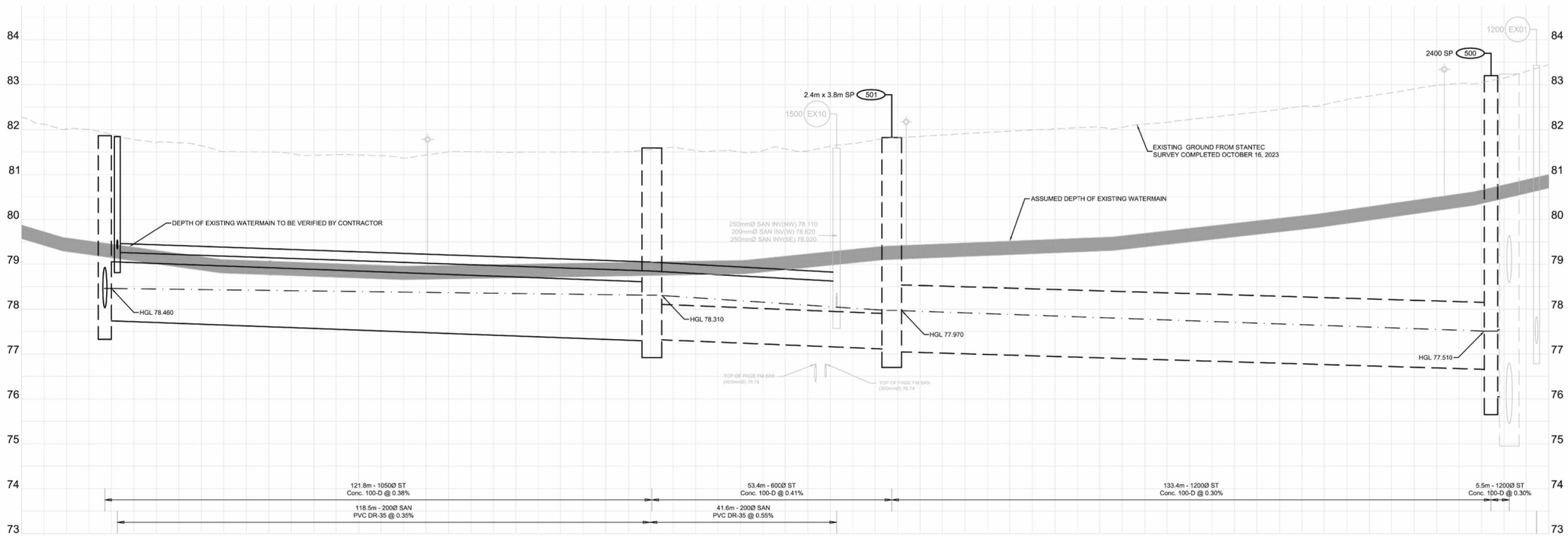

LEGEND

PROPERTY BOUNDARY

BH/MW24-6 — BOREHOLE NO. AND LOCATION

GS = 81.91m — GROUND SURFACE ELEVATION (Meters)

HORIZONTAL 1:1000

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FILE NO	OTT-21004743-B0

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
2983, 3053 & 3079 NAVAN ROAD, OTTAWA, ON

BOREHOLE LOCATION PLAN (NAVAN RD.)

SCALE 1:1,000

SKETCH NO FIG 2.3

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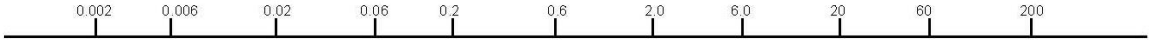
Notes On Sample Descriptions

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 24-02

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Brian Coburn Blvd.)

Figure No. 3

Page. 1 of 1

Date Drilled: 'June 10, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		ASPHALT ~150 mm thick	85.7	0
		GRANULAR FILL ~1050 mm thick Crushed limestone, brown and grey, moist, (very dense)	85.6	
		FILL Silty sand with clay pockets, brown, moist, (compact)	84.5	1
▽		**SILTY CLAY** Brown, moist to wet, (very stiff)	84.0 83.84	2
		150 mm thick loose silt layer at 3.3 m depth		3
		SILTY CLAY Grey, wet, (firm)	81.4	4
				5
				6
		Borehole Terminated at 6.7 m Depth	79.0	

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

75 | 15 | 6 | 4 | Hammer Weight | Hammer Weight

140 kPa | 130 kPa s = 4.3 | 125 kPa s = 5.0 | 36 kPa s = 3

SAMPLES	Natural Unit Wt. kN/m³
SS1	
SS2	
SS3	
V4	
SS5	
SS6	
SS7	

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well was installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21004743-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
July 8, 2024	1.9	

CORE DRILLING RECORD

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

Log of Borehole BH 24-03

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Brian Coburn Blvd.)

Figure No. 4

Page. 1 of 1

Date Drilled: 'June 10, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
	ASPHALT ~150 mm thick	85.71	0				
	GRANULAR FILL ~1050 mm thick Crushed limestone, dark grey, moist, (very dense)	85.6		59		SS1	
			1	19		SS2	
	FILL Silty clay with sand layers, brown, moist, (loose)	84.5					
		83.9	2	6		SS3	
	SILTY CLAY High plasticity, light brown to reddish brown, moist to wet, (very stiff)			3		SS4	
			3	125 kPa s = 4.2		V5	
		81.6	4	2		SS6	
	SILTY CLAY High plasticity, grey, wet, (firm to stiff)			53 kPa s = 8.8			
			5	Hammer Weight		SS7	
			6	41 kPa s = 8.2			
		79.3					
	Borehole Terminated at 6.4 m Depth						

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole was 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-21004743-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	5.8	no cave-in

CORE DRILLING RECORD

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

Log of Borehole BH 24-04

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Brian Coburn Blvd.)

Figure No. 5

Page. 1 of 1

Date Drilled: 'June 10, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		ASPHALT ~150 mm thick	85.59	0
		GRANULAR FILL ~1050 mm thick Crushed limestone, brown and grey, moist, (very dense)	85.4	
		FILL Silty sand with gravel, brown, wet, (loose)	84.4	1
▽			83.63	2
		SILTY CLAY Light brown to reddish brown, moist, (stiff to very stiff)	83.0	
			80.7	4
		SILTY CLAY Grey, wet, (firm)		5
			79.2	6
		Borehole Terminated at 6.4 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

	SPT N	Shear Strength	Natural Moisture Content	Sample	Natural Unit Wt. kN/m³
0	76			SS1	
1	21			SS2	
	9			SS3	
2	8			SS4	
3		180 kPa, s = 5.1			
4	4			SS5	
		82 kPa, s = 6.3			
5	Hammer Weight			SS6	
6		43 kPa, s = 9			

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well was installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21004743-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
July 8, 2024	2.0	

CORE DRILLING RECORD

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

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

Log of Borehole BH 24-06

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Navan Road)

Figure No. 6

Page. 1 of 1

Date Drilled: 'June 11, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~230 mm thick	81.91	0				
		GRANULAR FILL ~570 mm thick Crushed limestone, RAP and sand and gravel fill, brown and grey, moist, (very dense)	81.7		50		SS1	
		ASPHALT ~100 mm thick	81.1					
		FILL Silty sand and gravel with clay pockets, brown, moist, (compact)	81.0	1	12		SS2	
		TOPSOIL ~100 mm thick	80.5					
		SILTY SAND Blueish grey, moist, (loose)	80.4		7		SS3	
		SILTY CLAY Reddish brown, moist to wet, (very stiff)	80.1	2	180 kPa s = 5.1		V4	
			80.08	3	4		SS5	
		SILTY CLAY Grey, wet, (soft to stiff)	78.3	4	67 kPa s = 5.6			
				5	Hammer Weight		SS6	
					24 kPa no remold strength			
				6	Hammer Weight	81	SS7	
		Borehole Terminated at 6.7 m Depth	75.2					

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well was installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21004743-B0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
July 8, 2024	1.8	

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

Log of Borehole BH 24-07

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Navan Road)

Figure No. 7

Page. 1 of 1

Date Drilled: 'June 11, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	Soil Description	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Samples	Natural Unit Wt. kN/m³
	ASPHALT ~200 mm thick	81.42	0				
	GRANULAR FILL ~500 mm thick Crushed limestone, RAP and sand and gravel fill, brown and grey, moist, (dense)	81.2		45	×	SS1	
		80.7					
	ASPHALT ~100 mm thick	80.6					
	GRANULAR FILL ~200 mm thick Sand and gravel fill, brown, moist, (compact)	80.4	1	15	×	SS2	
▼	**FILL** Silty sand and gravel with clay pockets, brown, moist, (compact)	80.0					
		79.82					
	SAND Some silt, brown, wet, (loose)	79.6		9	×	SS3	
	SILTY SAND Grey, wet, (loose)		2				
				6	×	SS4	
		78.4	3				
	SILTY CLAY Grey, wet, (firm)			Hammer Weight	×	SS5	
			4	29 kPa + no remold			
				Hammer Weight	×	SS6	
			5	34 kPa + s = 6.8			
			6				
				Hammer Weight	×	SS7	
	Borehole Terminated at 6.7 m Depth	74.7					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole was 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-21004743-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	1.6	1.6

CORE DRILLING RECORD

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

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

Log of Borehole BH 24-08

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Navan Road)

Figure No. 8

Page. 1 of 1

Date Drilled: 'June 11, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~200 mm thick	81.48	0				
		GRANULAR FILL ~900 mm thick Crushed limestone over sand and gravel to silty sand, brown and grey, moist, (dense)	81.3		46		SS1	
			80.4	1	23		SS2	
		ASPHALT ~100 mm thick	80.3					
		GRANULAR FILL ~300 mm thick Silty sand and gravel, brown, moist, (compact)	80.0					
		SILTY CLAY Brown, moist, (very stiff)		2	7		SS3	
					175 kPa s = 5.8		V4	
		SILTY CLAY Grey, wet, (soft to firm)	78.5	3	2		SS5	
				4	19 kPa s = 3.8			
					Hammer Weight		SS6	
				5	29 kPa no remold			
				6	Hammer Weight		SS7	
			74.8					
		Borehole Terminated at 6.7 m Depth						

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole was 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-21004743-B0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
Upon Completion	no water	no cave-in

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

Log of Borehole BH 24-10

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Navan Road)

Figure No. 9

Page. 1 of 1

Date Drilled: 'June 12, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		ASPHALT ~110 mm thick	81.95	0
		GRANULAR FILL ~740 mm thick Crushed limestone, grey, moist, (very dense)	81.8	
		FILL Silty sand with clayey pockets, trace gravel, dark grey, moist, (compact)	81.1	1
		SILTY CLAY Brown, moist, (very stiff)	80.5	
▽			79.98	2
		SILTY CLAY Grey, wet, (stiff)	77.9	4
			75.3	6
		Borehole Terminated at 6.7 m Depth		

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

58 (SS1) | 14 (SS2) | 7 (SS3) | 130 kPa, s = 4.3 | 5 (SS4) | 100 kPa, s = 5.9 (V5) | Hammer Weight (SS6) | 62 kPa, s = 13.0 | Hammer Weight (SS7)

Combustible Vapour Reading (ppm) 250 500 750

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

SAMPLES: SS1, SS2, SS3, SS4, V5, SS6, SS7

Natural Unit Wt. kN/m³

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well was installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21004743-B0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
July 8, 2024	2.0	

CORE DRILLING RECORD

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

Log of Borehole BH 24-11

Project No: OTT-21004743-B0

Project: Off-Site Servicing for Proposed Residential Development

Location: 2983, 3053 and 3079 Navan Road, Ottawa, Ontario (Navan Road)

Figure No. 10

Page. 1 of 1

Date Drilled: 'June 12, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: SMP

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

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

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		ASPHALT ~120 mm thick	82.35	0				
		GRANULAR FILL ~700 mm thick Crushed limestone, grey, moist, (dense)	82.2		44	×	SS1	
			81.6					
		FILL Silty sand with clayey pockets, topsoil inclusions, dark brown, moist, (loose)		1	9	×	SS2	
			81.1					
		SILTY CLAY Brown, moist, (very stiff)			8	×	SS3	
				2	130 kPa s = 6.5			
			79.4					
		SILTY CLAY Grey, wet, (firm to stiff)		3	2	×	SS4	
				4	58 kPa s = 5.8			
					Hammer Weight	89 ×	SS5	
				5	29 kPa no remold			
				6	Hammer Weight	81 ×	SS6	
			75.7					
		Borehole Terminated at 6.7 m Depth						

LOG OF BOREHOLE NAVAN ROAD OFF-SITE SERVICING - BOREHOLE LOGS.GPJ TROW OTTAWA.GDT 8/9/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole was 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-21004743-B0

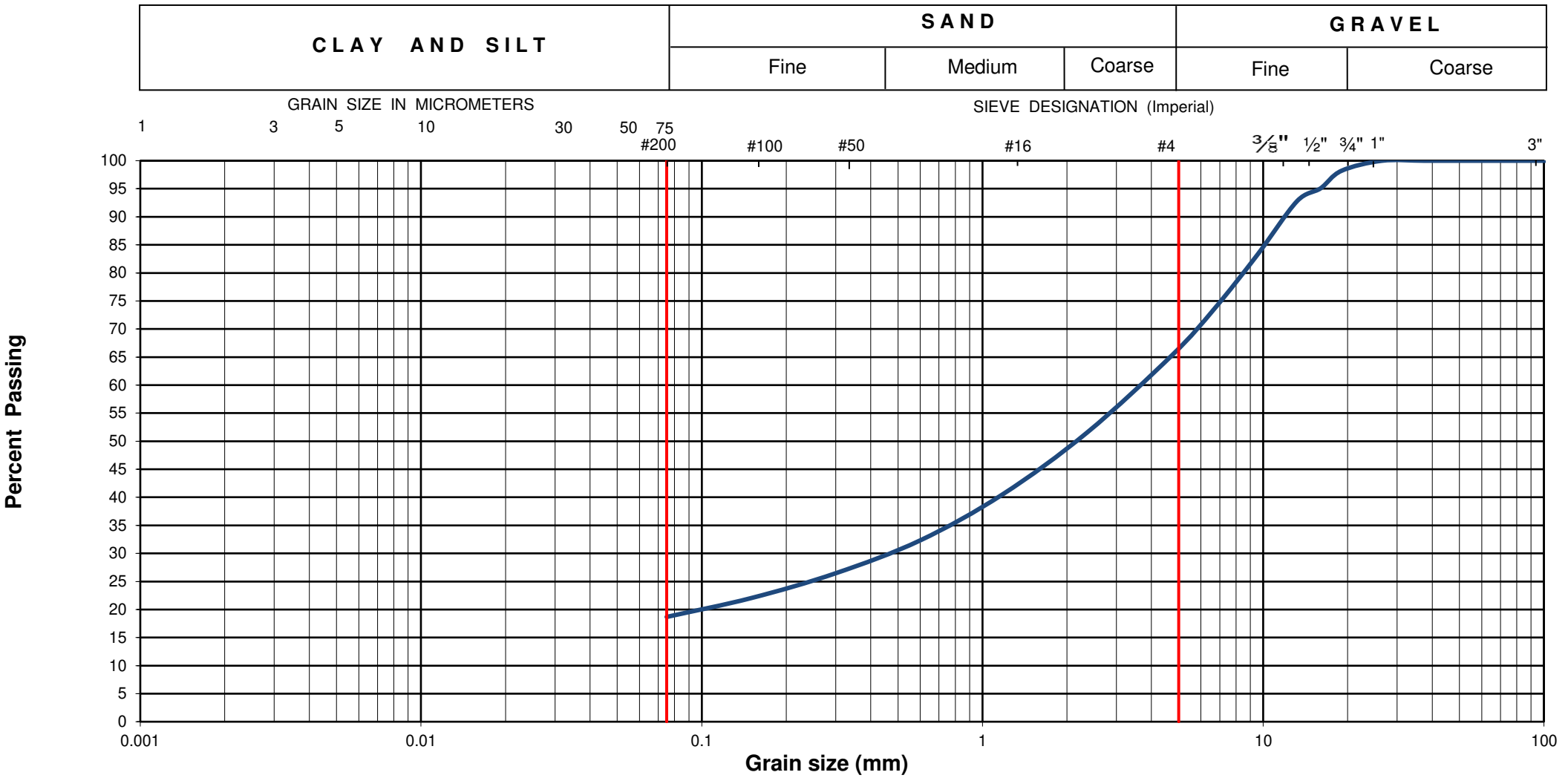
WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
Upon Completion	0.5	6.0

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

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

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

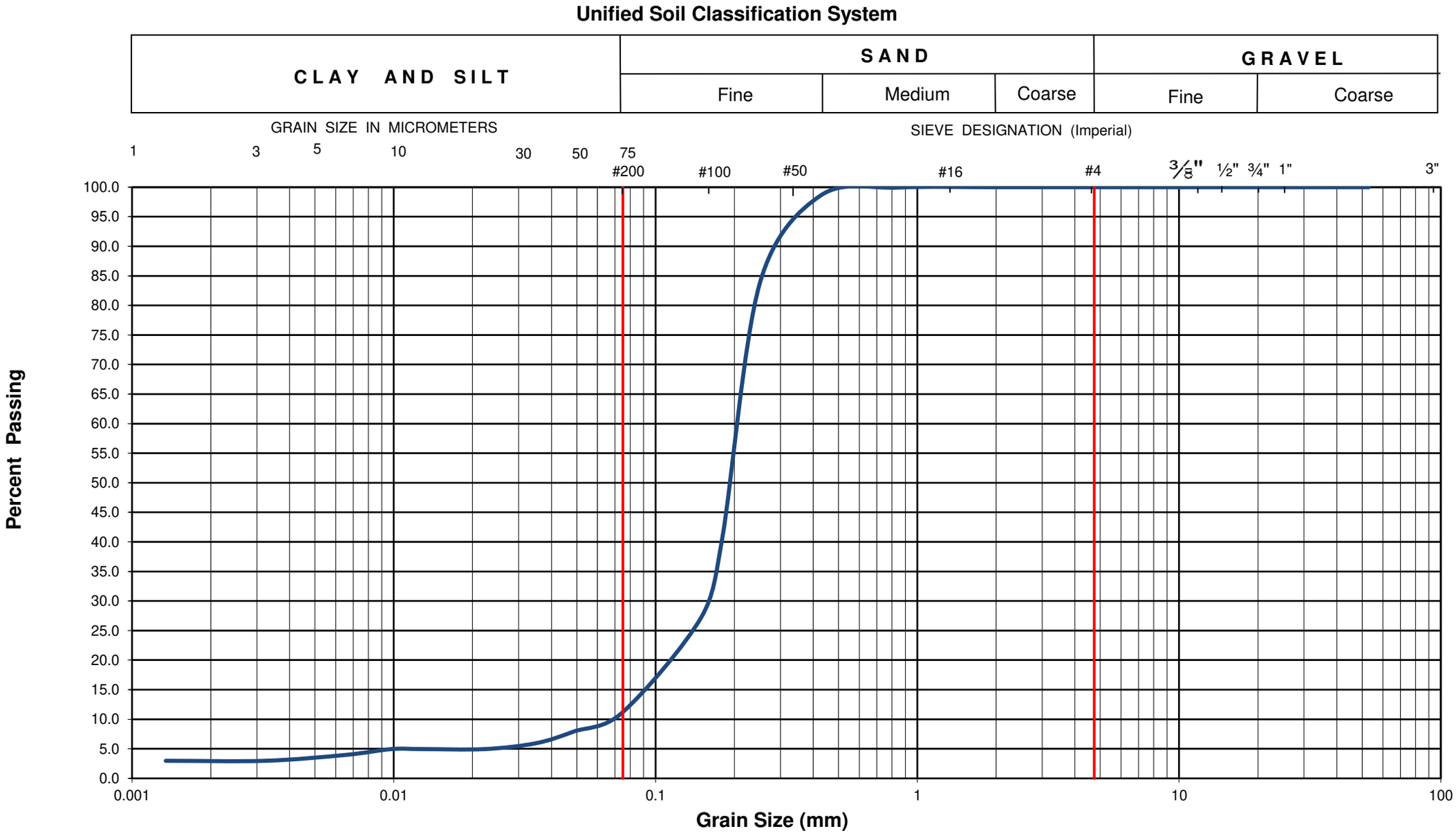
Unified Soil Classification System



EXP Project No.:	**OTT-21004743-B0**	**Project Name :**	**Geotechnical Investigation - Off-Site Servicing**						
Client :	**12714001 Canada Inc.**	**Project Location :**	**Navan Road Subdivision**						
Date Sampled :	**June 12, 2024**	**Borehole No:**	**BH23-10**	**Sample:**	**GS1**			**Depth (m) :**	**0.2-0.8**
Sample Composition :		**Gravel (%)**	**35**	**Sand (%)**	**46**	**Silt & Clay (%)**	**19**	**Figure :**	**11**
Sample Description :	**GRANULAR FILL: Silty Sand with Gravel (SM)**								

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

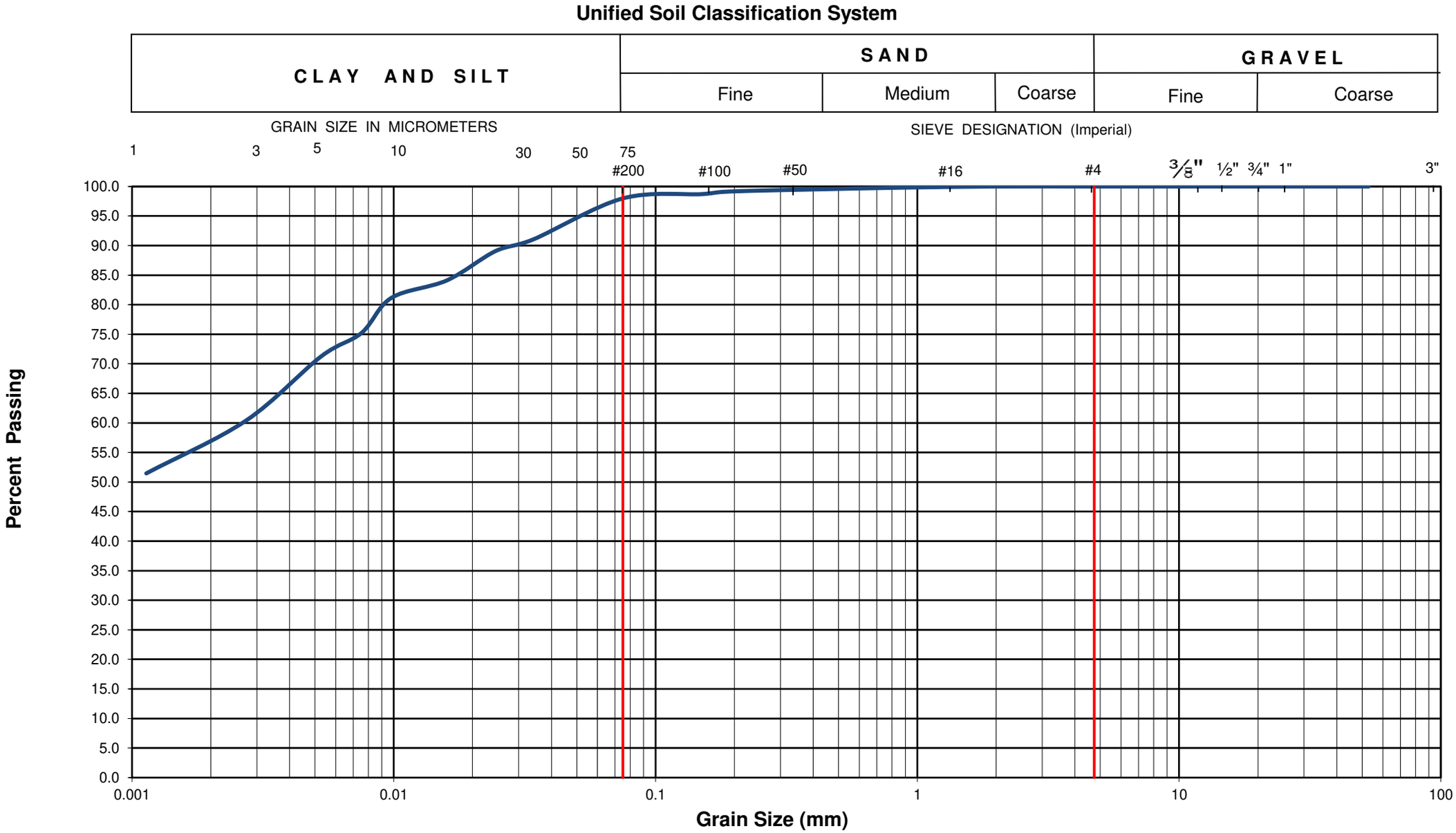
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-21004743-A0**	**Project Name :**	**Geotechnical Investigation - Off-Site Servicing**						
Client :	**12714001 Canada Inc.**	**Project Location :**	**Navan Road Subdivision**						
Date Sampled :	**June 11, 2024**	**Borehole No:**	**BH23-7**		**Sample No.:**	**SS3**		**Depth (m) :**	**1.5-2.1**
Sample Description :		**% Silt and Clay**	**11**	**% Sand**	**89**	**% Gravel**	**0**	**Figure :**	**12**
Sample Description :		**Poorly Graded Sand with Silt (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

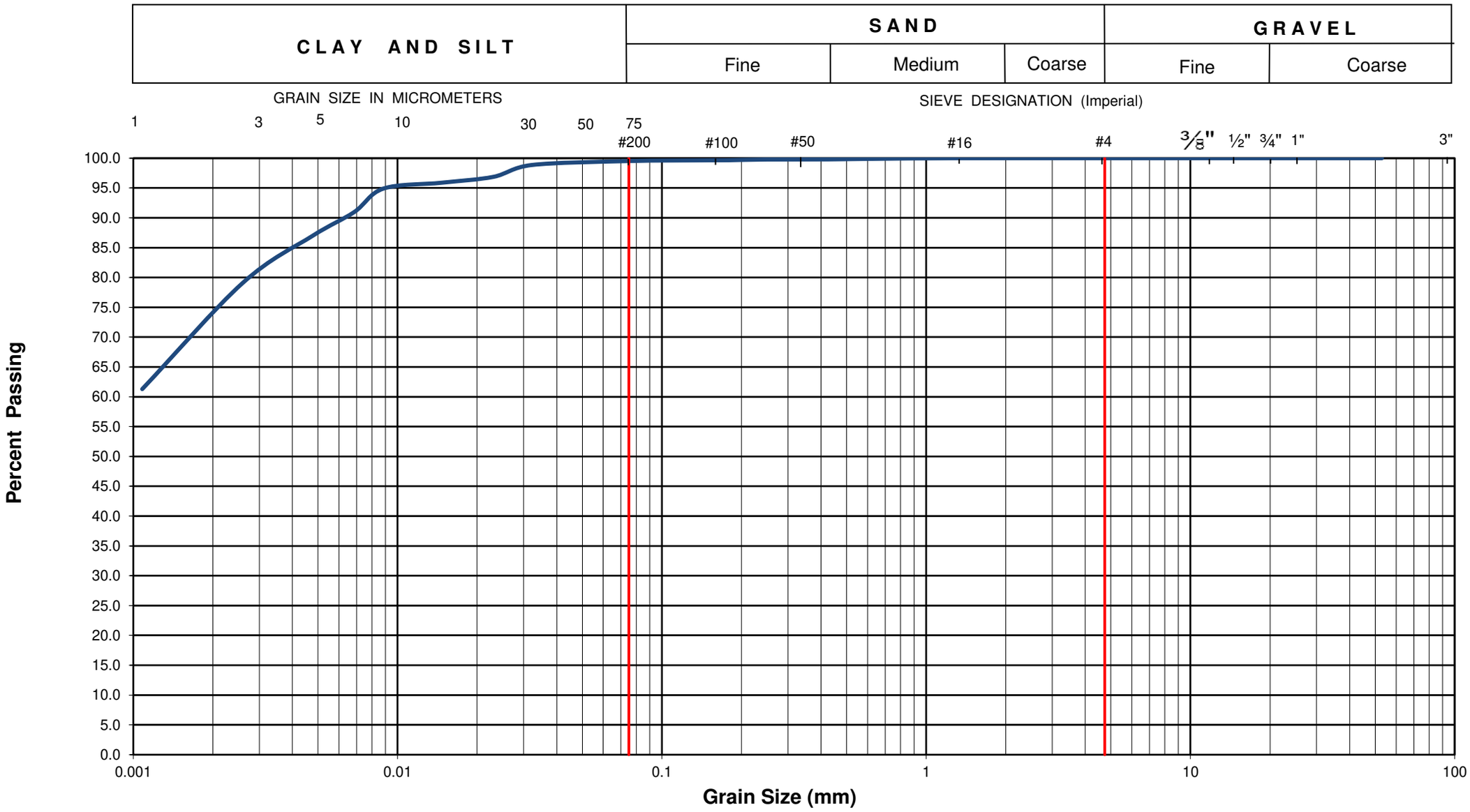


EXP Project No.:	**OTT-21004743-B0**	**Project Name :**	**Geotechnical Investigation - Off-Site Servicing**						
Client :	**12714001 Canada Inc.**	**Project Location :**	**Navan Road Subdivision**						
Date Sampled :	**June 10, 2024**	**Borehole No:**	**BH23-3**		**Sample No.:**	**SS4**		**Depth (m) :**	**2.3-2.9**
Sample Description :		**% Silt and Clay**	**98**	**% Sand**	**2**	**% Gravel**	**0**	**Figure :**	**13**
Sample Description :		**Clay of High Plasticity (CH)**							

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

Unified Soil Classification System



EXP Project No.:	**OTT-21004743-B0**	**Project Name :**	**Geotechnical Investigation - Off-Site Servicing**						
Client :	**12714001 Canada Inc.**	**Project Location :**	**Navan Road Subdivision**						
Date Sampled :	**June 10, 2024**	**Borehole No:**	**BH23-3**		**Sample No.:**	**SS7**		**Depth (m) :**	**5.3-5.9**
Sample Description :		**% Silt and Clay**	**100**	**% Sand**	**0**	**% Gravel**	**0**	**Figure :**	**14**
Sample Description :		**Clay of High Plasticity (CH)**							

Appendix A:
Laboratory Certificate of Analysis

AGAT Laboratories

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

CLIENT NAME: **EXP SERVICES INC**
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899
ATTENTION TO: **Matthew Zammit**
PROJECT: **OTT-21004743-B0**
AGAT WORK ORDER: **24Z162579**
SOIL ANALYSIS REVIEWED BY: **Nivine Basily, Inorganic Team Lead**
DATE REPORTED: **Jul 04, 2024**
PAGES (INCLUDING COVER): **5**
VERSION*: **2**

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

Notes

VERSION 2:Version 2 supersedes work order 24Z162579 , Version 1, issued June 121, 2024. pH included.

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: 24Z162579

PROJECT: OTT-21004743-B0

CLIENT NAME: EXP SERVICES INC

ATTENTION TO: Matthew Zammit

SAMPLING SITE:Navan Road Subdivision, Ottawa, Ontario

SAMPLED BY:EXP

Inorganic Chemistry (Soil)

DATE RECEIVED: 2024-06-13 **DATE REPORTED: 2024-07-04**

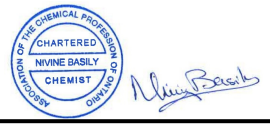
				BH 23-2 SS5	BH23-4 SS5	BH23-7 SS4	BH23-11 SS4
		SAMPLE DESCRIPTION:		(10'-12')	(12.5'-14.5')	(7.5'-9.5')	(10'-12')
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		2024-06-10	2024-06-10	2024-06-11	2024-06-12
Parameter	Unit	G / S	RDL	5936670	5936671	5936672	5936673
pH (2:1)	pH Units		N/A	8.20	7.74	8.71	7.78
Chloride (2:1)	µg/g		2	189	328	239	625
Sulphate (2:1)	µg/g		2	86	148	131	103
Resistivity (2:1) (Calculated)	ohm.cm		1	1960	1150	2110	690

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

5936670-5936673 pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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: 24Z162579

PROJECT: OTT-21004743-B0

ATTENTION TO: Matthew Zammit

SAMPLING SITE:Navan Road Subdivision, Ottawa, Ontario

SAMPLED BY:EXP

Soil Analysis

RPT Date: Jul 04, 2024			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)															
pH (2:1)	5936670	5936670	8.20	8.16	0.5%	N/A	89%	80%	120%						
Chloride (2:1)	5936670	5936670	189	194	2.6%	< 2	98%	70%	130%	99%	80%	120%	96%	70%	130%
Sulphate (2:1)	5936670	5936670	86	87	1.2%	< 2	100%	70%	130%	100%	80%	120%	98%	70%	130%

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

Certified By:

AGAT Laboratories

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

Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 24Z162579

PROJECT: OTT-21004743-B0

ATTENTION TO: Matthew Zammit

SAMPLING SITE:Navan Road Subdivision, Ottawa, Ontario

SAMPLED BY:EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH (2:1)	INOR 93-6075	modified from EPA 9045D, MCKEAGUE 3.11 E3137	PC TITRATE
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION

AGAT Laboratories

Have feedback? Scan here for a quick survey!

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

Chain of Custody Record

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

Report Information:

Company: EXP Services Inc
Contact: Matthew Zammit
Address: 2650 Queensview Drive, Suite 100
Ottawa, Ontario, K2B 8H6
Phone: 613-688-18966 Fax:
Reports to be sent to:
1. Email: matthew.zammit@exp.com
2. Email: ryan.digiuseppe@exp.com

Project Information:

Project: OTT-21004743-B0
Site Location: Navan Road Subdivision, Ottawa, Ontario
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

☐ Regulation 406
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
☐ Regulation 558
☐ CCME

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

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

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

Legal Sample ☐

Sample Matrix Legend

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

Laboratory Use Only

Work Order #: 24716257 9

Cooler Quantity: one - no ice packs
Arrival Temperatures: 22.6 | 22.5 | 22.6
~~Depot~~ Temperatures: 3.9 | 4.0 | 4.2
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: BL7

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

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

OR Date Required (Rush Surcharges May Apply):

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

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

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	Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	BTEX, F1-F4 PHCs	VOC	PAHs	PCBs: Aroclors ☐	O. Reg 406: Regulation 406 Characterization Package	pH, Metals, BTEX, F1-F4	EC, SAR	Regulation 406 SPLP Rainwater Leach	nSPLP: ☐ Metals ☐ VOCs ☐ SVOCs ☐ DOC	O. Reg 558: Landfill Disposal Characterization TCLP: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ BHsP ☐ PCBs	Corrosivity: ☐ Moisture ☐ Sulphide	pH	Sulphates	Chlorides	Electro Resistivity			Potentially Hazardous or High Concentration (Y/N)
1. BH 23-2 SS5 (10'-12')	June 10	AM/PM	1																	☑	☑	☑	☑			
2. BH23-4 SS5 (12.5'-14.5')	June10	AM/PM	1																	☑	☑	☑	☑			
3. BH23-7 SS4 (7.5'-9.5')	June 11	AM/PM	1																	☑	☑	☑	☑			
4. BH23-11 SS4 (10'-12')	June 12	AM/PM	1																	☑	☑	☑	☑			
5.		AM/PM																								
6.		AM/PM																								
7.		AM/PM																								
8.		AM/PM																								
9.		AM/PM																								
10.		AM/PM																								
11.		AM/PM																								

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			C. Gutierrez	06/13/24	16h08
CC to Pino	06/14/24	15h00		Date	Time
	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page ____ of ____
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Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

Appendix B:
Legal Notification

Legal Notification

This report was prepared by EXP Services Inc. (EXP) for the account of 12714001 Canada Inc.

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

Report Distribution

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