Geotechnical Investigation
Proposed Residential Development
1136 Gabriel Street,
Ottawa, ON

Client:
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Type of Document:
FINAL REPORT, Revision 1

Project Number:
OTT-23014181-G0

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Date Submitted: 2024.10.23

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Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed at 1136 Gabriel Street, Ottawa, Ontario, completed in support of site plan approval for a proposed residential development. Terms and conditions of this assignment were outlined in EXP Services Inc. (EXP) proposal OTT-23014181-G0 dated May 28, 2024. Authorization to proceed with this work was provided on June 6, 2024, by Pulse Societies Ltd via Po Number GBR-PO-100205-212. This report supersedes the geotechnical report submitted on July 31, 2024.

It is our understanding that the existing residence at the site is to be demolished to allow for the construction of a new apartment building. The architectural drawing set for the proposed development, dated September 20, 2024, and prepared by Lalande and Doyle Architects Inc. (L+D), indicates that the residence will be a four (4) storey structure with one basement level and have an approximate footprint area of 326 m^2. The finished floor elevation (FFE) of the basement is indicated as Elevation 63.43 m. The building will also include an elevator shaft and a mechanical room with a FFE of Elevation 61.90 m. No underside of footing (USF) elevations were available at the time of this report and it has been assumed that footings will be approximately at 0.6 m below the FFE elevations. Therefore, the USF elevation of footings below the basement slab are assumed to be at Elevation 62.8 m and the USF elevation of footings below the mechanical room/elevator shaft are assumed to be at Elevation 61.3 m. The development will also include new surface parking spaces and an access laneway to the south and to the west of the proposed building, respectively.

The EXP grading plan, drawing C200, dated October 21, 2024, indicates a proposed grade raise of up to 0.2 m. The drawing also indicates that a retaining wall is being proposed inside property line along the boundaries with the neighboring properties. The retaining wall will typically be 0.4 m above the grade of the surrounding properties, with sections extending as high as 0.7 m above the surrounding properties.

The EXP site servicing plan, drawing C100, dated October 21, 2024, indicates that a new watermain and sanitary sewer will run from the existing services running along Gabriel Street to the proposed building. The drawing indicates that the invert elevations of the underground services will be as deep as Elevation 62.00 m.

A Phase One Environmental Site Assessment (ESA) was also completed by EXP concurrently with the geotechnical investigation and the result of this assessment is reported in a separate document.

The fieldwork for this investigation was undertaken on July 9 and July 12, 2024, and consists of the drilling of three (3) boreholes (Borehole Nos. 1 to 3) advanced to auger refusal and termination depths ranging from 4.9 m to 11.3 m below the existing ground surface. The fieldwork was supervised on a full-time basis by a representative from EXP.

The borehole information indicates that the subsurface conditions within the site consist of surficial topsoil and fill underlain by a silty clay crust extending to depths of 3.0 m to 3.6 m (Elevation 62.1 m to Elevation 61.5 m) overlain by a stiff to very stiff unweathered silty clay extending to 5.9 m depth (Elevation 59.4 m to Elevation 59.2 m). The clay is underlain by glacial till. Auger refusal was met in Borehole No. 2 at 11.3 m depths (Elevation 53.8 m) and may indicate cobbles or boulders within the glacial till or the bedrock surface. The groundwater level was found to be at 4.0 m depth (Elevation 61.3 m) below the existing ground surface 8 days following completion of drilling.

Provided that the footings are placed on the native silty clay then Table 4.1.8.4.A of the 2012 Ontario Building Code (OBC) as amended January 1, 2022, indicates that the site classification for seismic response is estimated to be **Class C**. A review of the subsurface soils encountered at the boreholes indicates that there is no liquefaction potential of the soils at the site during a seismic event.

The EXP grading plan, drawing C200, dated October 21, 2024, indicates a grade raise of up to 0.2 m is proposed. A grade raise of up to 0.5 m is considered to be acceptable.

Footings founded at Elevation 62.8 m on the brown very stiff to hard silty clay may be designed for a bearing capacity at serviceability limit state (SLS) of 150 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 200 kPa. Footings founded at Elevation 61.3 for the mechanical room and elevator pad, founded on the grey stiff to very stiff silty clay, may be designed for a bearing capacity at serviceability limit state (SLS) of 100 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 150 kPa. The factored geotechnical resistance value at ULS includes a resistance factor of 0.5. The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations are expected to be less than 25 mm and 19 mm respectively. The SLS and factored ULS values are valid provided the site grade raise discussed in Section 7 is respected.

Footings founded in soils at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical (10H:7V) from the near edge of the lower footing, as shown below. This concept should also be applied to service excavation, etc. to ensure that undermining is not a problem.

It is recommended that perimeter and underfloor drainage systems should be provided. The floor slab for the elevator pit and mechanical room should be designed as a watertight structure

Excavation for the construction of footings and the installation of underground services are anticipated to extend to a maximum depth of Elevation 61.3 m. The excavations will extend through the topsoil, fill and silty clay. The excavations are anticipated to be near or above the groundwater level for the excavations of footings for the basement and underground services and below the groundwater table for the excavation of the elevator pit and mechanical room.

The excavation within the subsurface soils should comply with the most recent Occupational Health and Safety Act (OHSA), Ontario Regulations 213/91 (August 1, 1991).

It is anticipated that the majority of the material required for backfilling purposes for the proposed building would have to be imported and should preferably conform OPSS 1010 Granular B Type II. Trench backfill and parking lot/laneway subgrade fill should consist of OPSS 1010 Granular B Type I or OPSS 1010 Select Subgrade Material (SSM).

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

Pavement structure for the proposed parking lot and laneway should consist of 65 mm thick asphaltic concrete, 150 mm thick OPSS Granular A base and 450 mm thick OPSS Granular B Type II subbase.

The clayey soils at this site are considered to have a medium to high potential for soil volume change. Therefore, the tree planting should be carried out in accordance with the 2017 City of Ottawa Tree Planting Guidelines.

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

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed at 1136 Gabriel Street, Ottawa, Ontario, completed in support of site plan approval for a proposed residential development. Terms and conditions of this assignment were outlined in EXP Services Inc. (EXP) proposal OTT-23014181-G0 dated May 28, 2024. Authorization to proceed with this work was provided on June 6, 2024, by Pulse Societies Ltd via Po Number GBR-PO-100205-212. This report supersedes the geotechnical report submitted on July 31, 2024.

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The EXP grading plan, drawing C200, dated October 21, 2024, indicates a proposed grade raise of up to 0.2 m. The drawing also indicates that a retaining wall is being proposed inside property line along the boundaries with the neighboring properties. The retaining wall will typically be 0.4 m above the grade of the surrounding properties, with sections extending as high as 0.7 m above the surrounding properties.

The EXP site servicing plan, drawing C100, dated October 21, 2024, indicates that a new watermain and sanitary sewer will run from the existing services running along Gabriel Street to the proposed building. The drawing indicates that the invert elevations of the underground services will be as deep as Elevation 62.00 m.

A Phase One Environmental Site Assessment (ESA) was also completed by EXP concurrently with the geotechnical investigation and the result of this assessment is reported in a separate document.

The geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at three (3) borehole locations;
b) Classify the site for seismic site response in accordance with the requirements of the 2012 Ontario Building Code (as amended January 1, 2022) and assess the potential for liquefaction of the subsurface soils during a seismic event;
c) Comment on grade-raise restrictions ;
d) Make recommendations regarding the most suitable type of foundations, founding depth and bearing pressure at serviceability limit state (SLS) and factored geotechnical resistance at ultimate limit state (ULS) of the founding strata and comment on the anticipated total and differential settlements of the recommended foundation type;
e) Discuss slab on grade construction and drainage;
f) Provide lateral earth pressure parameters (for static and seismic conditions) for the subsurface (basement) walls;
g) Discuss backfilling requirements and assessment of the suitability of on-site soils for backfilling purposes;
h) Pipe bedding requirements for the proposed underground services;
i) Comment on excavation conditions and de-watering requirements during construction; and
j) Comment on the corrosion potential of subsurface soils buried concrete and steel structures/members.

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

2. Site Description

The site is located at 1136 Gabriel Street and is located between St. Joseph Boulevard and Rocque Street. The site is rectangular in shape and has a total area of approximately 840 m^2. A site location plan is provided as Figure 1.

The site is currently occupied by a one to one and a half storey, multi-tenant building with a finished basement and a concrete block foundation. It is understood that a sump pit is present in the basement. The site also includes a grass covered backyard and an asphaltic concrete paved driveway.

The ground surface generally flat with elevations at the borehole locations ranging from Elevation 65.33 m to Elevation 65.07 m.

3. Geology of the Site

3.1 Surficial Geology

The surficial geology was reviewed via the Google Earth applications published by the Ontario Ministry of Energy, Northern Development and Mines available via www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/surficial-geology and was last modified on May 23, 2017. The map indicates that beneath any fill the site is underlain by fine-textured glaciolacustrine deposits consisting of silt and silty clay and minor sand and gravel. The surficial deposits are shown in Image 1 below.

🟦 Fine-textured glaciolacustrine deposits: silt and silty clay, minor sand and gravel

Image 1 – Surficial Geology

3.2 Bedrock Geology

The bedrock geology was reviewed via the Google Earth applications published by the Ontario Ministry of Energy, Northern Development and Mines available via http://www.geologyontario.mndm.gov.on.ca/mines/data/google/MRD219/geology/doc.kml and publish in 2007. The map indicates dolostone and minor shale and sandstone of the Oxford Formation.

🟦 Dolostone and minor shale and sandstone of the Oxford Formation

Image 2 – Bedrock Geology

4. Procedure

4.1 Fieldwork

The fieldwork for this investigation was undertaken on July 9 and July 12, 2024, and consists of the drilling of three (3) boreholes (Borehole Nos. 1 to 3) advanced to auger refusal and termination depths ranging from 4.9 m to 11.3 m below the existing ground surface. The fieldwork was supervised on a full-time basis by a representative from EXP.

The locations and geodetic elevations of the boreholes were established by a survey crew from EXP and are shown on the borehole location plan, Figure 2. Prior to drilling, the locations of the boreholes were cleared of any public and private underground services by a subcontractor retained by EXP.

The boreholes at the front and side of the existing residence (Borehole Nos. 1 and 2) were drilled using a CME-55 track mounted drill rig equipped with continuous flight hollow stem augers. The borehole in the backyard of the existing residence (Borehole No. 3) was drilled using hand portable equipment. Standard penetration tests (SPTs) were performed in the boreholes at 0.6 m to 1.5 m depth intervals with soil samples retrieved by the split-barrel sampler. A Dynamic Cone Penetration Test (DCPT) was conducted approximately at Borehole No. 2 from 1.5 m depth to the depth of dynamic cone refusal, 10.4 m below existing grade. The undrained shear strengths of the cohesive soils were measured by conducting penetrometer and in-situ vane tests. The subsurface soil conditions in each borehole were logged with each soil sample placed in a labelled plastic bag.

A nineteen (19) mm piezometer with a screened section was installed in Boreholes No. 2 for long-term monitoring of the groundwater. The piezometer was installed in accordance with EXP standard practice, and the installation configuration is documented on the respective borehole log. The boreholes were backfilled upon completion of the field work and the installation of the monitoring wells.

4.2 Laboratory Testing Program

Upon completion of the borehole fieldwork, the soil samples were transported to the EXP Ottawa laboratory. The soil samples were visually examined in the laboratory by a geotechnical engineer. The soil samples were classified in accordance with the Unified Soil Classification System (USCS) and the modified Burmister System (as per the 2006 Fourth Edition Canadian Foundation Engineering Manual (CFEM)).

A summary of the soil sample laboratory testing program is shown in Table I.

Table I: Summary of Laboratory Testing Program

Type of Test	Number of Tests Completed
Moisture Content Determination	28
Unit Weight Determination	5
Grain Size Analysis	3
Atterberg Limits	2
Corrosion Analysis (pH, sulphate, chloride and resistivity)	2

5. Subsurface Conditions and Groundwater Levels

A detailed description of the subsurface conditions and groundwater levels from this geotechnical investigation are given on the attached Borehole Logs, Figure Nos. 3 to 5 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 also may result in changes in the conditions interpreted to exist at the locations where sampling was conducted.

Boreholes were drilled to provide representation of subsurface conditions as part of a geotechnical exploration program. Reference should be made to the Phase I ESA for the environmental aspects of the project.

It should be noted that the soil and rock boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling operations. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The “Note on Sample Descriptions” preceding the borehole logs form an integral part of this report and should be read in conjunction with this report.

A review of the borehole logs indicates the following subsurface conditions with depth and groundwater levels.

5.1 Topsoil

A 300 mm thick surficial topsoil layer was encountered in Borehole Nos. 1 and 3.

5.2 Asphaltic Concrete

A 25 mm thick surficial asphaltic concrete layer was encountered in Borehole No. 2.

5.3 Fill

A layer of fill encountered under the topsoil or asphaltic concrete in Borehole Nos. 1 and 2 and ranges in consistency from sand and gravel to silty clay with gravel. The fill extends to 0.7 to 1.1 m depth (Elevation 64.6 m to Elevation 64.0 m). The standard penetration test (SPT) N-values of the fill range from 5 to 8 indicating a loose state. The natural moisture content of the fill ranges from 4 percent to 24 percent.

5.4 Silty Clay

The fill or topsoil is underlain by native undisturbed silty clay in all of the boreholes. The silty clay extends to the depth of sampling, 4.9 m depth (Elevation 60.2 m) in Borehole No. 3 and in Borehole Nos. 1 and 2, the silty clay was fully penetrated and extends to 5.9 m depth (Elevation 59.4 m to Elevation 59.2 m).

The silty clay consists of an upper weathered desiccated brown silty clay crust underlain by a weaker unweathered grey silty clay. The upper crust extends from 3.0 m to 3.6 m depth (Elevation 62.1 m to Elevation 61.5 m). The undrained shear strength of the upper crust ranges from 120 kPa to 216 kPa indicating a very stiff to hard consistency. The unit weights and natural moisture contents of the weathered crust ranges 18.6 kN/m^3 to 19.7 kN/m^3 and from 29 percent to 55 percent, respectively.

The lower unweathered grey silty clay’s undrained shear strength ranged from 95 kPa to 135 kPa indicating a stiff to very stiff consistency. The natural moisture contents of the unweathered grey silty clay ranges from 52 percent to 57 percent.

The results from the grain-size analysis and Atterberg limit determination conducted on two (2) selected samples of the silty clay are summarized in Table II. The grain-size distribution curves are shown in Figures 6 and 7.

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

Borehole No. (BH) – Sample No. (SS)	Depth (m)	Grain-Size Analysis (%)				Atterberg Limits (%)			Soil Classification (USCS)
		Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH1-SS3	2.3 - 2.9	0	2	32	66	56	25	31	Silty Clay of High Plasticity (CH) - Trace Sand
BH2 - SS5	3.8 – 4.4	0	2	43	55	47	23	24	Silty Clay of Medium Plasticity (CI) - Trace sand

Based on a review of the results of the grain-size analysis and Atterberg limits, the soil may be classified as ranging from a silty clay of high plasticity (CH) with trace sand to a silty clay of medium plasticity (CI) with trace sand in accordance with the Unified Soil Classification System (USCS).

5.5 Glacial Till

The silty clay in Borehole Nos. 1 and 2, where the silty clay was fully penetrated, is underlain by glacial till encountered at 5.9 m depth (Elevation 59.4 m to Elevation 59.2 m) in Borehole Nos. 1 and 2, respectively. Borehole No. 1 terminated within the glacial till. The glacial till contains varying amounts of gravel, sand, silt, clay and shale within the soil matrix as well as cobbles and boulders. It is in a loose to dense state as indicated by the standard penetration test (SPT) N-values ranging from 8 to 46. DCPT refusal occurred at 10.4 m depth (Elevation 54.7 m) on a cobble or boulder. The moisture content of the glacial till ranges form 9 percent to 15 percent.

Results of grain-size analyses conducted on one (1) samples of the glacial till is summarized in Table III. The grain-size distribution curves are shown in Figure 8.

Table III: Summary of Results from Grain-Size Analysis - Glacial Till Sample

Borehole No. (BH) – Sample No. (SS)	Depth (m)	Grain-Size Analysis (%)				Soil Classification
		Gravel	Sand	Silt	Clay	
BH2 - SS9	7.6 - 8.2	32	41	23	4	Silty Gravelly Sand (SM) – Trace Clay

Based on a review of the results from the grain size analysis, the glacial till may be classified as a silty gravelly sand (SM), trace clay, in accordance with the Unified Soil Classification System (USCS).

5.6 Auger Refusal and Bedrock

Refusal to augers was met in Borehole No. 2 at 11.3 m depth (Elevation 53.8 m). The auger refusal may indicate the bedrock surface or cobbles or boulders within the glacial till.

5.7 Groundwater Level Measurements

The groundwater level measurement taken in the piezometer is shown in Table IV.

Table IV: Summary of Groundwater Level Measurements

Borehole (BH)	Ground Surface Elevation (m)	Date of Measurement (Elapsed Time in Days from Date of Installation)	Screened Material	Groundwater Depth Below Ground Surface (Elevation), m
BH-1	65.33	June 17, 2024 (8 Days)	Silty Clay	4.0 (61.3)

The groundwater level was found to be at 4.0 depth (Elevation 61.3 m) below the existing ground surface in the piezometer installed in Borehole No. 1.

Water levels were determined in the boreholes and in the piezometer at the times and under the conditions noted above. 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.

6. Site Classification for Seismic Site Response and Liquefaction Potential of Soils

6.1 Site Classification for Seismic Site Response

The borehole information indicates that the subsurface conditions within the site consist of surficial topsoil and fill underlain by native silty clay and glacial till. Refusal to augers was met in Borehole No. 2 at 11.3 m depth (Elevation 53.8 m). The auger refusal may indicate the bedrock surface or cobbles or boulders within the glacial till.

Provided that the footings are placed on the native silty clay then Table 4.1.8.4.A of the 2012 Ontario Building Code (OBC) as amended January 1, 2022, indicates that the site classification for seismic response is estimated to be **Class C**.

6.2 Liquefaction Potential of Soils

A review of the subsurface soils encountered at the boreholes indicates that there is no liquefaction potential of the soils at the site during a seismic event.

7. Grade Raise Restrictions

The EXP grading plan, drawing C200, dated October 21, 2024, indicates a grade raise of up to 0.2 m is proposed. A grade raise of up to 0.5 m is considered to be acceptable.

8. Site Grading

It is understood that the existing structures along with all existing infrastructure will be demolished and removed off site to allow the construction of the new building.

Site grading within the **proposed building footprint** area should consist of the removal of all existing fill, topsoil and organic stained soils down to the native undisturbed silty clay and should be examined by a geotechnician. Any loose/soft areas identified during the overburden subgrade examination should be excavated, removed and replaced with Ontario Provincial Standard Specification (OPSS) Granular B Type II material compacted to 98 percent standard Proctor maximum dry density (SPMDD). Once the subgrade has been approved, the grades may be raised to the design underside footing and floor slab elevation by the construction of an engineered fill pad constructed in accordance with Section 9 of this report.

Site grading within the footprint of the **new parking lot and laneway** should consist of the removal of the surficial topsoil and organic stained soils and proofrolling the exposed soil with a heavy vibratory roller the presence of a geotechnician. Any loose/soft areas identified during the proofrolling process should be excavated, removed and replaced with Ontario Provincial Standard Specification (OPSS) Granular B Type II or OPSS Select Subgrade Material (SSM) compacted to 95 percent standard Proctor maximum dry density (SPMDD).

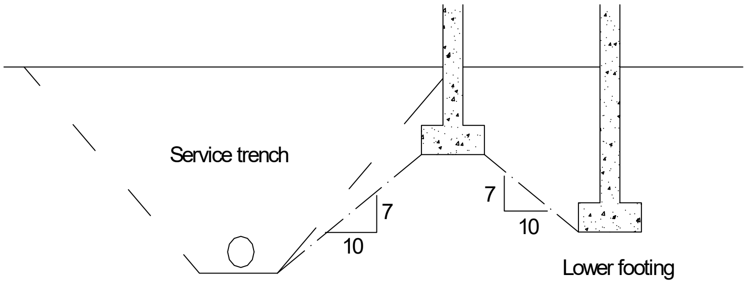
9. Foundation Considerations

Based on the FFE provided L+D in the architectural drawings, the USF elevation of footings below the basement slab have been assumed to be at Elevation 62.8 m and the USF elevation of footings below the mechanical room/elevator shaft have been assumed to be Elevation 61.3 m.

A review of the borehole logs indicates that weathered brown silty clay crust was present at 0.7 m to 1.1 m depth (Elevation 64.6 m to Elevation 64.0 m) and unweathered grey silty clay present at 3.0 m to 3.6 m depth (Elevation 62.1 m to Elevation 61.5 m). Based on the proposed USF elevations, it is expected the foundations for the building will be generally founded on the brown weathered crust and the foundations for the elevator shaft and mechanical room will be founded on the grey silty clay. The existing topsoil and fill are not considered as a suitable founding medium for the footings and where present should be removed with footing founded on either the native silty clay or on an engineered fill pad itself founded on the native silty clay.

Footings founded at Elevation 62.8 m on the brown very stiff to hard silty clay may be designed for a bearing capacity at serviceability limit state (SLS) of 150 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 200 kPa. Footings founded at Elevation 61.3 for the mechanical room and elevator pad, founded on the grey stiff to very stiff silty clay, may be designed for a bearing capacity at serviceability limit state (SLS) of 100 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 150 kPa. The factored geotechnical resistance value at ULS includes a resistance factor of 0.5. The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations are expected to be less than 25 mm and 19 mm respectively. The SLS and factored ULS values are valid provided the site grade raise discussed in Section 7 is respected.

Footings founded in soils at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical (10H:7V) from the near edge of the lower footing, as shown below. This concept should also be applied to service excavation, etc. to ensure that undermining is not a problem.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

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

Since the native silty clay is susceptible to disturbance due to the effects of weather and construction traffic, it is recommended that the approved native subgrade be covered within the same day of approval with 50 mm thick concrete mud slab.

Once the native subgrade has been approved, if required, the grade may be raised to the design underside footing and floor slab elevation by the construction of an engineered fill pad. The excavation for the removal of fill and topsoil layers should extend to a sufficient distance beyond the limits of the proposed structure to accommodate a 1.0 m wide horizontal bench of engineered fill that extends beyond the perimeter of the proposed building on all sides, which should thereafter be sloped at an inclination of 1H to 1V down to the approved subgrade. The engineered fill should consist of OPSS Granular B Type II that is placed in 300 mm thick lifts and each lift compacted to 100 percent SPMDD. The placement and compaction of the engineered fill can in this way be undertaken to the founding level of the footings. From the footing level to the underside of the floor slab, each lift should consist of Granular B Type II or an approved material and should be compacted to 98 percent of SPMDD. 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 subsequent lift.

A minimum of 1.5 m of earth cover should be provided to the footings to protect them from damage due to frost penetration. The frost cover should be increased to 2.1 m for unheated structures if snow will not be removed from their vicinity. If snow will be removed from the vicinity of the unheated structures, the frost cover should be increased to 2.4 m. Rigid insulation thermally equivalent to the required soil cover may be used instead of the soil cover. Alternatively, a combination of rigid insulation and soil cover may be used to achieve the required frost protection for the footings.

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

10. Retaining Walls

It is understood that a retaining wall is to be constructed separating the site from the surrounding properties.

The retaining wall may be supported by strip footings up to 3.0 m width founded on the very stiff to hard native brown silty clay or on an engineered fill pad founded on very stiff to hard brown native silty clay, not deeper than Elevation 62.8 m, may be designed for a bearing capacity at serviceability limit state (SLS) of 150 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 200 kPa. The retaining wall is considered to be an unheated structure, and foundations should be placed at 2.1 m for unheated structures if snow will not be removed from their vicinity and to 2.4 m if snow will be removed from the vicinity of the structure. When earth cover is less than the minimum required, an equivalent thermal combination of earth cover and rigid insulation or rigid insulation alone should be provided.

The backfill behind retaining walls should consist of free-draining material, such as OPSS Granular B Type II material, and should be equipped with a permanent drainage system to prevent the build-up of hydrostatic pressure behind the wall. The drainage system should be positively (suitably) outletted away from the retaining wall.

The proposed retaining wall will be subjected to lateral static earth as well as lateral dynamic earth forces during a seismic event. Seismic loading will result in an increase in active lateral earth pressure on the wall. The seismic lateral earth pressure coefficient given below have been derived based on the peak horizontal ground acceleration (PGA) provided by Earthquakes Canada.

The expression below assumes the retaining wall is backfilled with free draining material, such as Ontario Provincial Standard Specification (OPSS) Granular B Type II and equipped with a permanent drainage system to prevent the buildup of hydrostatic pressure behind the wall.

The total lateral active pressure distribution can be separated into a static component and a dynamic component and may be determined as follows (Mononobe and Matsuo, 1929):

$$\sigma_{AE}(z) = K_A\gamma z + (K_{AE} - K_A)\gamma(H - z) + q \quad \text{……………………………………………………………… (i)}$$

Where $\sigma_{AE}(z)$ = the total combined lateral active earth pressure (dynamic and static) at depth z, (kPa)

z = depth below the top of the retaining wall (m)

K_A = static lateral active earth pressure coefficient

K_{AE} = combined (static and dynamic) lateral active earth pressure coefficient

γ = unit weight of the backfill soil (kN/m^3)

H = total height of the wall (m)

q = surcharge such as traffic and compaction pressure, where applicable (kPa)

For the total lateral active earth pressure, the seismic (dynamic) pressure distribution is an inverted triangle with maximum pressure at the top of the wall and a minimum at the bottom of the wall. Therefore, the resultant of the static and seismic (dynamic) pressures on the retaining wall is assumed to be applied at depths ranging between 0.67z from the top of the backfill behind the wall and 0.67 (H-z) from the bottom of the wall, respectively.

The lateral earth pressure parameters are summarized in Table V. The estimated lateral earth pressure parameters assume the back face of the wall is vertical, there is no friction between the concrete of the wall and the backfill soil behind the wall, no hydrostatic build-up behind the wall, the ground surface of the backfill behind the wall is level or flat and the ground surface of the backfill behind the wall is at the same level as the top of the retaining wall.

The following design parameters may be used in the design for the retaining wall:

Table V: Lateral Earth Pressure Retaining Walls

Soil Type	Glacial Till/OPSS Granular B Type II
Unit Weight of Soil (γ); kN/m3	22
Angle of Internal Friction (ϕ’); degrees	30^o
Coefficient of Static Active Lateral Earth Pressure, K_A	0.33
Combined Coefficient (Static and Dynamic) Active Lateral Earth Pressure, K_{AE}	0.46

For soil above the frost depth, the Coefficient of Static Passive Lateral Earth Pressure Coefficient, K_p should be considered to be equal to 1.0.

A global stability check will be required should the height of the wall exceed 1.0 m above the final grade.

For the calculation of the active dynamic (seismic) lateral earth pressure coefficients for retaining walls, the seismic coefficient in the horizontal direction, k_h, was taken as 0.5 times the PGA value of 0.379g. The PGA value was obtained from the 2020 National Building Code o f Canada Seismic Hazard Tool. The calculated active dynamic (seismic) lateral earth pressure coefficients in the vertical direction, k_v, was assumed to be zero.

The K_{AE} value calculations assume the back face of the wall is vertical, there is no friction between the concrete of the wall and the backfill soil (behind the wall) and the ground surface of the backfill (behind the wall) is level or flat and the ground surface of the backfill behind the wall is at the same level as the top of the retaining wall.

11. Floor Slab and Drainage Requirements

11.1 Drained Structure

The floor slab for the proposed residence may be designed as a slab-on-grade set on a bed of well compacted 19 mm sized clear stone at least 200 mm thick placed on a minimum 300 mm thick engineered fill pad placed on the approved silty clay or glacial till subgrade. The engineered fill pad should consist of Ontario Provincial Standard Specification (OPSS) Granular B Type II material compacted to a minimum of 98 percent standard Proctor maximum dry density (SPMDD). The clear stone would minimize the capillary rise of moisture from the sub-soil to the floor slab. As an alternative for the clear stone layer only, the floor slab may be cast on a 200 mm thick bed of Ontario Provincial Standard Specification (OPSS) Granular A compacted to 98 percent SPMDD and placed on the engineered fill pad and overlain by a vapour barrier. Adequate saw cuts should be provided in the floor slab to control cracking.

It is recommended that perimeter and underfloor drainage systems should be provided.

The floor slab should be set at a minimum of 150 mm higher than the surrounding final exterior grade.

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

11.2 Water-Tight Structure

The floor slab for the elevator pit and mechanical room should be designed as a watertight structure. Further discussion of watertight structures is provided in Section 12.2.

12. Lateral Earth Pressures Against Basement Walls

12.1 Lateral Earth Pressure Against Drained Subsurface Walls

The subsurface basement walls of the proposed building should be backfilled with free draining material, such as OPSS Granular B Type II compacted to 95 percent SPMDD and equipped with a perimeter drainage system to prevent the buildup of hydrostatic pressure behind the walls. The walls will be subjected to lateral static and dynamic (seismic) earth forces. The expressions below assume free draining backfill material, a perimeter drainage system, level backfill surface behind the wall and vertical face on the back side of the wall.

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

$P = K_0 (\gamma h + q)$ …………………………………………………………… (ii)

Where P = lateral earth pressure acting on the subsurface wall; kN/m^2

K_0 = lateral earth pressure coefficient for ‘at rest’ condition for Granular B Type II backfill material = 0.50

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

h = depth of point of interest below top of backfill, m

q = surcharge load stress, kPa

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

$\Delta_{Pe} = K_0 (\gamma h + q)$ …………………………………………………………… (iii)

Where Δ_{Pe} = dynamic thrust in kN/m of wall

H = height of wall, m

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

$\frac{a_h}{g}$ = seismic coefficient = 0.379 (Based on the PGA value provided by Earthquakes Canada)

F_b = thrust factor = 1.0

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

All subsurface walls should be properly waterproofed.

12.2 Lateral Earth Pressure Against Watertight Subsurface Walls

The subsurface walls of the elevator pit and mechanical room should be designed as a water-tight structure to withstand lateral earth (soil) pressure as well as full hydrostatic pressure. The walls should be backfilled with OPSS Granular B Type II material compacted to 98 percent SPMDD below the floor slab. For this purpose, the highest groundwater table at the site should be assumed to coincide with the ground surface. The lateral thrust on the subsurface walls due to earth and water pressures may be computed from the expression:

P = $\frac{1}{2}k\gamma' H^2 + kqH + \frac{1}{2}\gamma_w H^2$ …………………………………………………………… (iv)

Where P = lateral thrust due to earth and water pressure, kN/m

K_0 = lateral earth pressure coefficient for 'at rest' condition for Granular B Type II backfill material = 0.50

γ' = submerged unit weight of backfill = 12 kN kN/m^3

q = surcharge load stress, kPa

H = height of subsurface wall, m

γ_w = unit weight of water (9.81 kN/m^3)

In addition to the static earth and water pressures, the subsurface walls would be subjected to dynamic thrust from the soil during a seismic event. The subsurface walls would also be subjected to hydrodynamic thrust during a seismic event. The soil dynamic thrust (Δ_{Pe}) and the hydrodynamic thrust (P_w) may be computed from the equations given below:

Δ_{Pe} = $\gamma H^2 \frac{a_h}{g} F_b$ …………………………………………………………… (v)

Where Δ_{Pe} = dynamic thrust in kN/m of wall

H = height of elevator or sump pit wall, m

γ = unit weight of soil = 22 kN/m^3

$\frac{a_h}{g}$ = seismic coefficient = 0.379 (Based on the PGA value provided by Earthquakes Canada)

F_b = thrust factor = 1.0

The soil dynamic thrust acts approximately at 0.63H above the base of the wall.

P_w = $\frac{7}{12}\frac{a_h}{g}\gamma_w H^2$ …………………………………………………………… (vi)

Where P_w = hydrodynamic thrust in kN/m of wall

H = height of elevator shaft wall, m

γ_w = unit weight of water (9.81 kN/m^3)

$\frac{a_h}{g}$ = seismic coefficient = 0.379 (Based on the PGA value provided by Earthquakes Canada))

The hydrodynamic thrust (P_w) acts approximately at 0.4H above the base of the wall.

The total lateral thrust due to the water on the face of the subsurface walls is the sum of the hydrostatic and hydrodynamic thrusts.

All subsurface walls should be properly waterproofed.

13. Excavation and De-Watering Requirements

13.1 Excess Soil Management

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

13.2 Excavation

Excavation for the construction of footings and the installation of underground services are anticipated to extend to a maximum depth of Elevation 61.3 m. The excavations will extend through the topsoil, fill and silty clay. The excavations are anticipated to be near or above the groundwater level for the excavations of footings for the basement and underground services and below the groundwater table for the excavation of the elevator pit and mechanical room.

Excavations may be undertaken by conventional heavy equipment.

The excavation within the subsurface soils should comply with the most recent Occupational Health and Safety Act (OHSA), Ontario Regulations 213/91 (August 1, 1991). Based on the definitions contained in OHSA, the subsurface soils at the site are classified as Type 3 soil and sidewalls of open cut excavations must be cut back at 1H:1V from the bottom of the excavation. Below the groundwater table, the excavation side slopes are expected to slough and will eventually stabilize at a slope of 2H:1V to 3H:1V.

If side slopes noted above for the construction of the proposed building cannot be achieved due to space restrictions on site, such as the proximity of open cut excavations to the property limits or existing infrastructure, the excavation for the new building construction would have to be undertaken within the confines of an engineered support system (shoring system). If space restrictions prevent open cut excavations, the underground services may be installed within the confines of a prefabricated support system (trench box) which is designed and installed in accordance with the above-noted regulations.

The need for a shoring system, the most appropriate type of shoring system and the design and installation of the shoring system should be determined by the contractors bidding on this project. The design of the shoring system should be undertaken by a professional engineer experienced in shoring design and the installation of the shoring system should be undertaken by a contractor experienced in the installation of shoring systems. The shoring system should be designed and installed in accordance with latest edition of Ontario Regulation 213/91 under the OHSA and the 2006 Fourth Edition of the Canadian Foundation Engineering Manual (CFEM). The shoring system as well as adjacent settlement sensitive structures (buildings) and infrastructure should be monitored for movement (deflection) on a periodic basis during construction operations.

Excavations that terminate within the native silty clay near or above the groundwater table are not expected to experience a base-heave type of failure.

The native soils are susceptible to disturbance due to movement of construction equipment and personnel on its surface. It is therefore recommended that the excavation at the site should be undertaken by construction equipment that does not travel on the excavated surface, such as a gradall or mechanical shovel.

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.

13.3 De-Watering Requirements

Seepage of the surface and subsurface water into 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 and below the groundwater level, a higher seepage rate should be anticipated and may require high-capacity pumps to keep the excavation dry.

If less than 50 m^3 of water are to be pumped per day, no permits are required. If between 50 m^3 and 400 m^3 of water is to be pumped per day, then the activity should be registered on the Environmental Activity and Sector Registry (EASR), an online registry maintained by the Ministry of the Environment, Conservation and Parks (MECP). If more than 400 m^3 of water is to be pumped per day, then a Category 3 Permit to Take Water (PTTW) is required.

Since water taking can be groundwater, storm water, or a combination of both, the most likely potential for significant volumes of water requiring removal from an excavation at the site is storm water. If a major rain event occurs while a large excavation is open, then it is possible that the total accumulation of water within the excavation will exceed 50 m^3. If that occurs, then it may be removed without a permit by pumping over several days during which no single-day water-taking is more than 50 m^3. Alternatively, a maximum of 400 m^3 of water may be pumped per day once the online EASR application form is filled out and the fee is paid. The EASR application may be completed by the property owner or their delegate. EXP would be pleased to assist with the EASR, should it be deemed necessary. Per the terms of the EASR, the total quantities of water actually removed from the excavation must be reported to the MECP.

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.

14. Pipe Bedding Requirements

For site servicing, it is anticipated that the subgrade for the proposed underground services will consist of silty clay.

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).

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

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

If the backfill for the service trenches will consist of granular fill, clay seals should be installed in the service trenches at select intervals (spacing) as per City of Ottawa Drawing No. S8. The seals should be 1.0 m wide, extend over the entire trench width and from the bottom of the trench to the underside of the pavement structure. The 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 underground services should be installed in short open trench sections that are excavated and backfilled the same day.

15. Parking Lots and Laneways

Pavement structures for the proposed parking lot and laneway is given on Table VI below for the anticipated silty clay subgrade. The pavement structure is based upon the assumption that the subgrade will be properly prepared and assumes a functional design life of 15 to 18 years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table VI: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Computed Pavement Structure
		Light Duty Traffic (Cars Only)
Asphaltic Concrete (PG 58-34)	92-97% MRD	65 mm HL3/SP12.5 mm/ Cat. B
OPSS 1010 Granular A Base (crushed limestone)	100% SPMDD	150 mm
OPSS 1010 Granular B Type II Sub-base	100% SPMDD	450 mm

Notes:

1. SPMDD denotes standard Proctor maximum dry density, ASTM, D-698-12e2.
2. MRD denotes Maximum Relative Density, ASTM D2041.

The upper 300 mm of the subgrade fill must be compacted to 98% SPMDD.

Additional comments on the construction of the parking lot and laneway are as follows:

1. As part of the subgrade preparation, the proposed parking lot and laneway should be stripped of topsoil and other obviously unsuitable material. 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 subgrade areas detected should be sub excavated and properly replaced with suitable approved backfill compacted to 95 percent SPMDD (ASTM D698-12e2). The subgrade should be covered with geotextile prior to placing granular materials.
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. Subdrains should be installed on both sides of the laneway(s). Subdrains must be installed in the proposed parking area at low points and should be continuous between catchbasins or open drainage ditches to intercept excess surface and subsurface moisture and to prevent subgrade softening. This will ensure no water collects in the granular course, which could result in pavement failure during the spring thaw. The location and extent of subdrains required within the paved areas should be reviewed by this office in conjunction with the proposed site grading.
3. 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.
4. Relatively weaker subgrade may develop over service trenches at subgrade level. These areas may require the use of thicker/coarser sub-base material and the use of a geotextile at the subgrade level. If this is the case, it is recommended that additional 150 mm of granular sub-base, OPSS Granular B Type II, should be provided in these areas, in addition to the use of a geotextile at the subgrade level.
5. The granular materials used for pavement construction should conform to Ontario Provincial Standard Specifications (OPSS 1010) for Granular A and Granular B Type II and should be compacted to 100 percent of the SPMDD.

The asphaltic concrete use and placement should meet OPSS 1150 or 1151 requirements. It should be compacted from 92 percent to 97 percent of the MRD (ASTM D2041). Asphalt placement should be in accordance with OPSS 310 and OPSS 313.

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

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

It is anticipated that the majority of the material required for backfilling purposes for the proposed development would have to be imported and should preferably conform to the following specifications:

- Engineered fill under footings for the proposed building - OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 100 percent SPMDD,
- Engineered fill under the floor slab - OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent SPMDD,
- Backfill in footing trenches and against foundation walls – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent of the SPMDD inside the building and 95 percent SPMDD outside the building respectively.
- Backfill in services trenches inside building – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent of the SPMDD.
- Backfill in exterior services trenches (above the bedding and cover) – On site desiccated silty clay, if compactable, placed in 300 mm thick lifts and each lift compacted to 95 percent of the SPMDD. The compactability of the clay should be determined prior to its use. It the clay is not suitable for compaction purposes; exterior service trenches should be backfilled with OPSS 1010 Granular B Type I or OPSS 1010 Select Subgrade Material (SSM) placed in 300 mm thick lifts and each lift compacted to 95 percent of the SPMDD.

17. Corrosion Potential

Chemical tests limited to pH, sulphate, chloride and resistivity were undertaken on two (2) soil sample. A summary of the results is shown in Table VII. The laboratory certificate of analysis is shown in Appendix A.

Table VII: Corrosion Test Results on Soil Samples

Borehole – Sample No.	Depth (m)	Soil Type	pH	Sulphate (%)	Chloride (%)	Resistivity (ohm-cm)
BH1 SS4	2.3 - 2.9	Silty Clay	6.93	0.012	0.0415	1190
BH1 SS7	4.6 - 5.2	Glacial Till	6.96	0.009	0.0075	3530

The results indicate the silty clay has a negligible potential for 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 soil is mildly corrosive to corrosive to bare steel as per the National Association of Corrosion Engineers (NACE) guidelines. Appropriate measures should be taken to protect the buried bare steel from corrosion.

18. Tree Planting Restrictions

The guidelines indicate that for street trees in the road right-of-way, where sensitive marine clays have been identified, the trees are to have a setback equal to or greater than the full mature height of the tree. This setback can be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium (mature tree height 7.5m to 14.0 m) sized trees if a total of six conditions are met. Two of the six requirements, listed below, require comment from a geotechnical perspective.

- The modified plasticity index of the soil between the underside of footing (USF) and a depth of 3.5 m generally does not exceed 40%. This corresponds to soils with low/medium potential for soil volume change.
- The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall) to provide ductility as described in the Geotechnical Report

The silty clay extends to 4.9 m to 5.9 m depths (Elevation 60.2 m to Elevation 59.2 m) and based on a design underside of footing elevation of Elevation 62.8 m, extends up to 3.6 m below the underside of footing elevation. The silty clay is considered to have a medium to high potential for soil volume change based on modified plasticity index values of 26 percent and 42 percent.

As mentioned in the guidelines, it is noted that the foundations walls are to have a minimum reinforcement of two upper and two lower 15M bars if a reduced setback distance is applied.

19. Earthworks Quality Control During Construction

All earthworks activities from construction of footing foundations to subgrade preparation to the placement and compaction of fill soils should be inspected by geotechnical personnel to ensure that construction proceeds in accordance with the project specifications.

20. General Comments

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

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

Daniel Wall

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Geotechnical Engineer
Earth and Environment

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

LICENSED PROFESSIONAL ENGINEER
Oct 23, 2024
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PROVINCE OF ONTARIO

Figures

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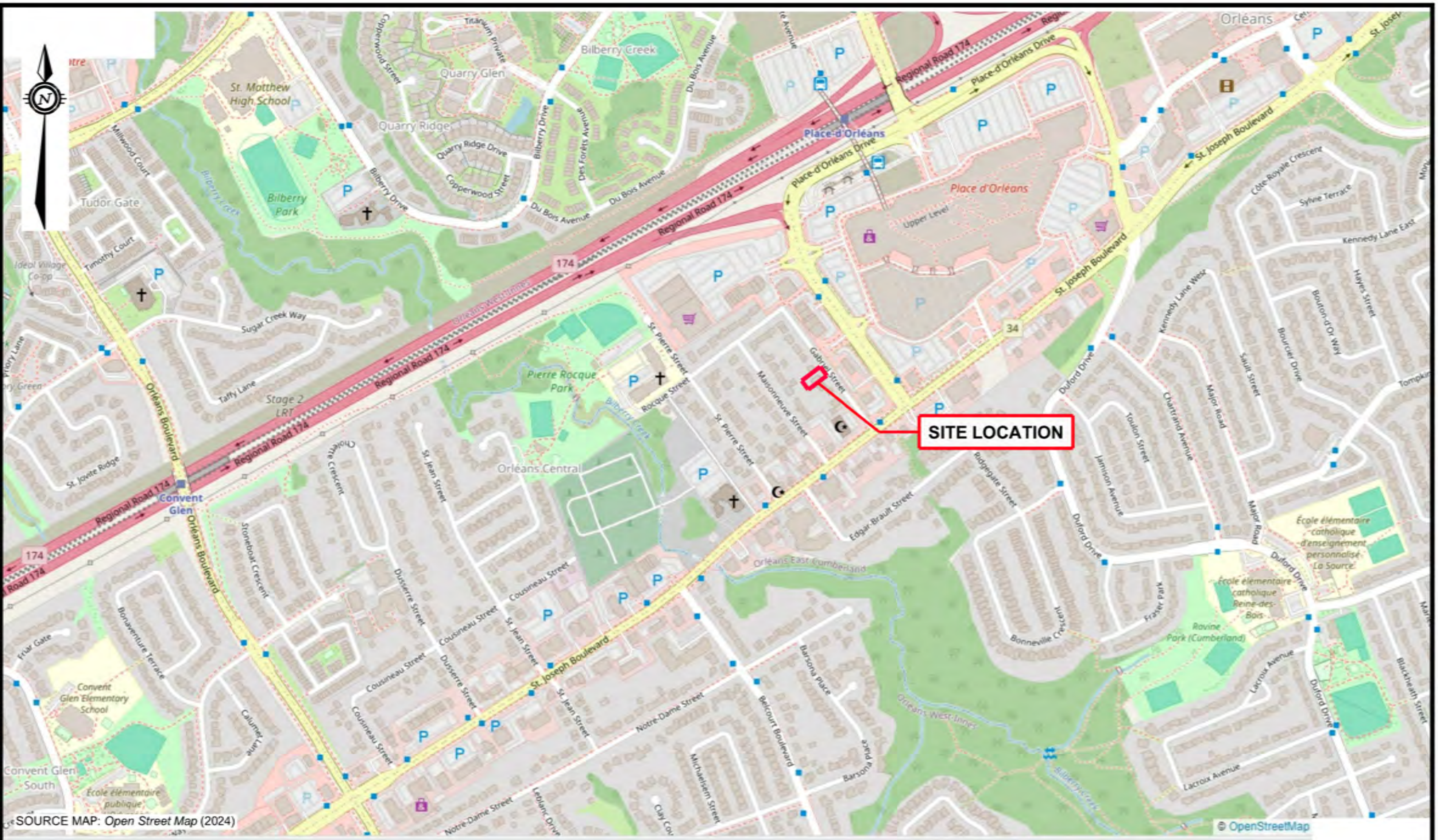


SOURCE MAP: *Open Street Map* (2024)

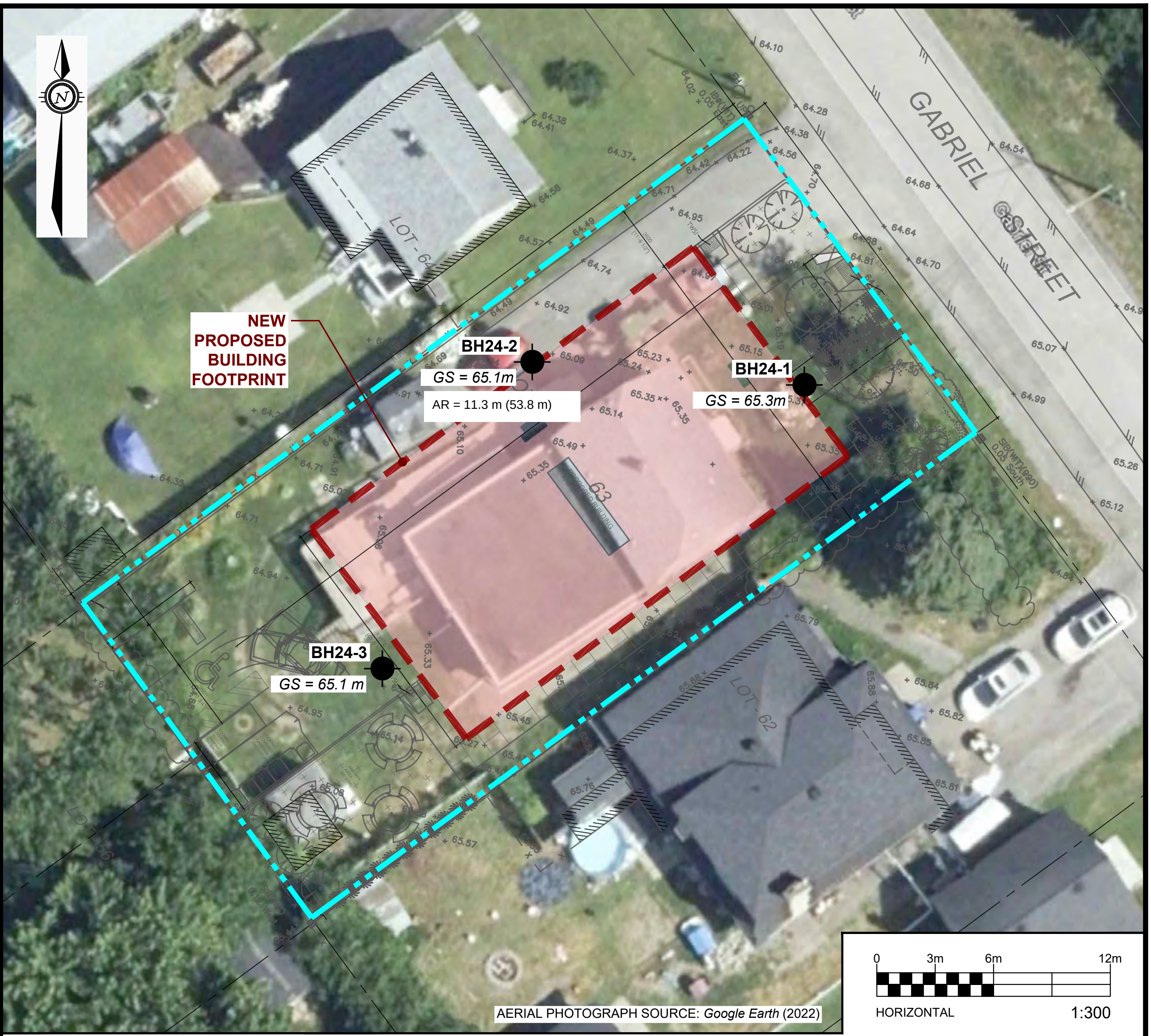
LEGEND

🟥 APPROXIMATE SITE BOUNDARY

0 100m 200m 400m
HORIZONTAL 1:10,000

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

DATE JULY 2024		CLIENT: PULSESOCIETIES LTD. PROPERTY ADDRESS: 1136 GABRIEL STREET, OTTAWA, ONTARIO	project no. OTT-23014181-G0
DESIGN DW	CHECKED IT	PROJECT: GEOTECHNICAL INVESTIGATION	scale 1:10,000
DRAWN BY AS		TITLE: SITE LOCATION PLAN	FIG 1



AERIAL PHOTOGRAPH SOURCE: *Google Earth* (2022)

LEGEND

-·-·-	PROPERTY BOUNDARY
BH24-1 ●	BOREHOLE NUMBER AND LOCATION
GS = 65.3m	APPROX. GROUND SURFACE ELEVATION (m)
AR = 11.3 m (53.8 m)	AUGER REFUSAL DEPTH (ELEVATION)

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. BOREHOLE ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
4. ASPHALT AND TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION AT THE TEST HOLE LOCATIONS.
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 INFORMATION OBTAINED FROM *LALANDE + DOYLE ARCHITECTS INC.* ., PROJECT NO.: 24-002B, DWG NO.: A-100, DATED 2024/06/26.

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

DATE
JULY 2024

DESIGN DW
CHECKED IT
DRAWN BY AS

CLIENT: PULSESOCIETIES LTD.
PROPERTY ADDRESS: 1136 GABRIEL STREET, OTTAWA, ONTARIO
PROJECT: GEOTECHNICAL INVESTIGATION
TITLE: BOREHOLE LOCATION PLAN

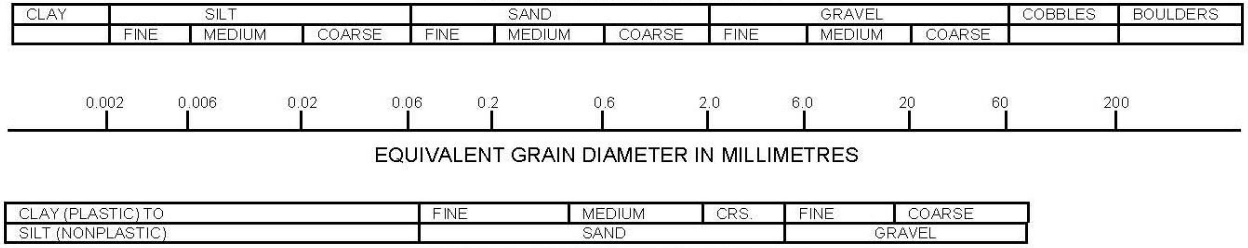
project no. OTT-23014181-G0
scale 1:300
FIG 2

Filename: \\exp\data\OTT\OTT-23014181-G0\60 Execution\65 Drawings\OTT-23014181-G0_Geo_1136-Gabriel-St.dwg
Last Saved: Jul 15, 2024 11:10 AM Last Plotted: Jul 18, 2024 8:52 AM Plotted by: WallD

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



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-1

Project No: OTT-23014181-G0

Project: Proposed Residential Development

Location: 1136 Gabriel Street, Ottawa, ON

Figure No. 3

Page. 1 of 1

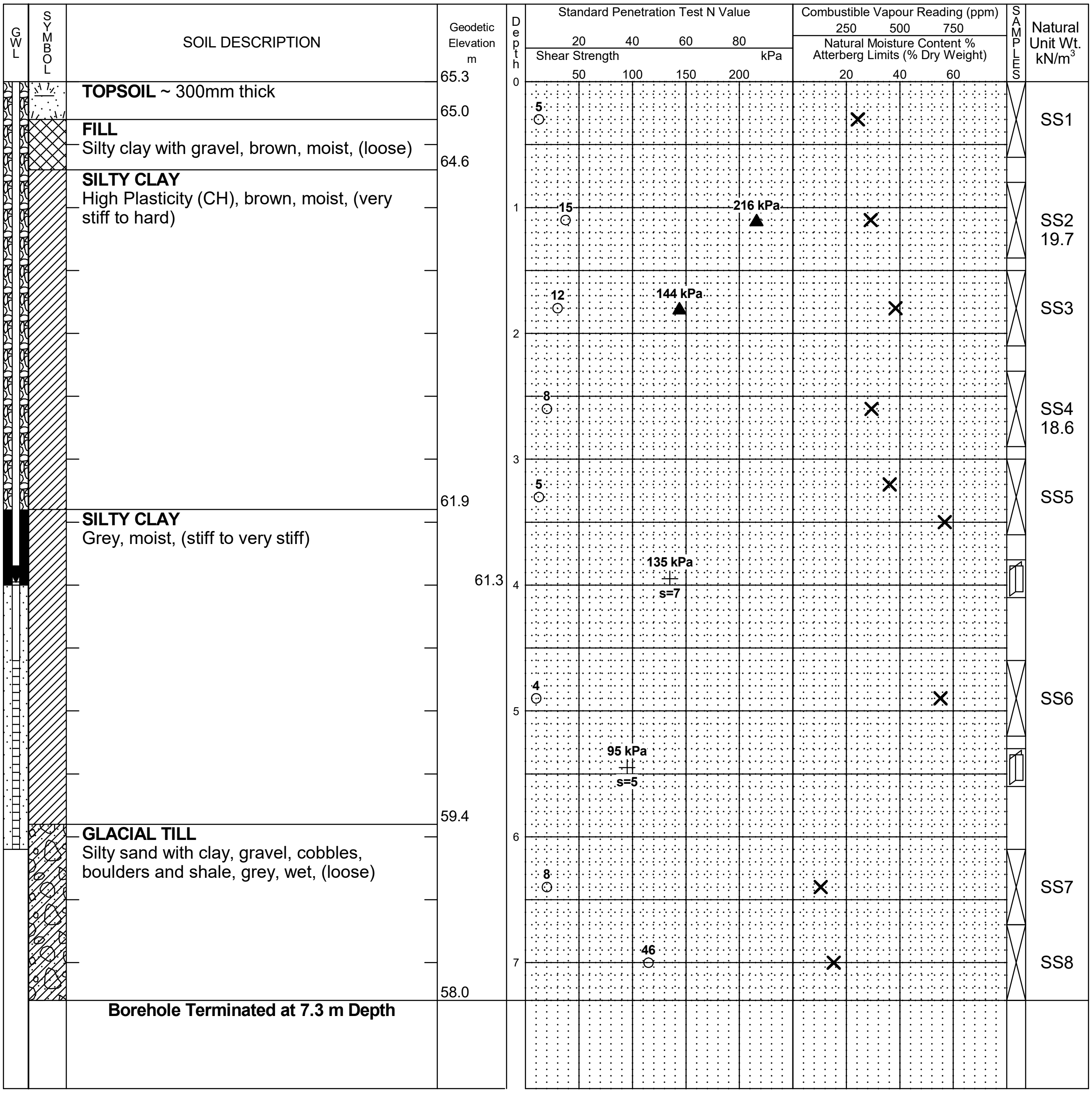
Date Drilled: 'July 9, 2024

Drill Type: CME-55 Track Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

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		



TOPSOIL ~ 300mm thick

FILL
Silty clay with gravel, brown, moist, (loose)

SILTY CLAY
High Plasticity (CH), brown, moist, (very stiff to hard)

SILTY CLAY
Grey, moist, (stiff to very stiff)

GLACIAL TILL
Silty sand with clay, gravel, cobbles, boulders and shale, grey, wet, (loose)

Borehole Terminated at 7.3 m Depth

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm slotted standpipe was installed in the borehole upon completion
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23014181-G0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
7/17/2024	4.0	

CORE DRILLING RECORD

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

Log of Borehole BH-2

Project No: OTT-23014181-G0

Project: Proposed Residential Development

Location: 1136 Gabriel Street, Ottawa, ON

Figure No. 4

Page. 1 of 2

Date Drilled: 'July 9, 2024

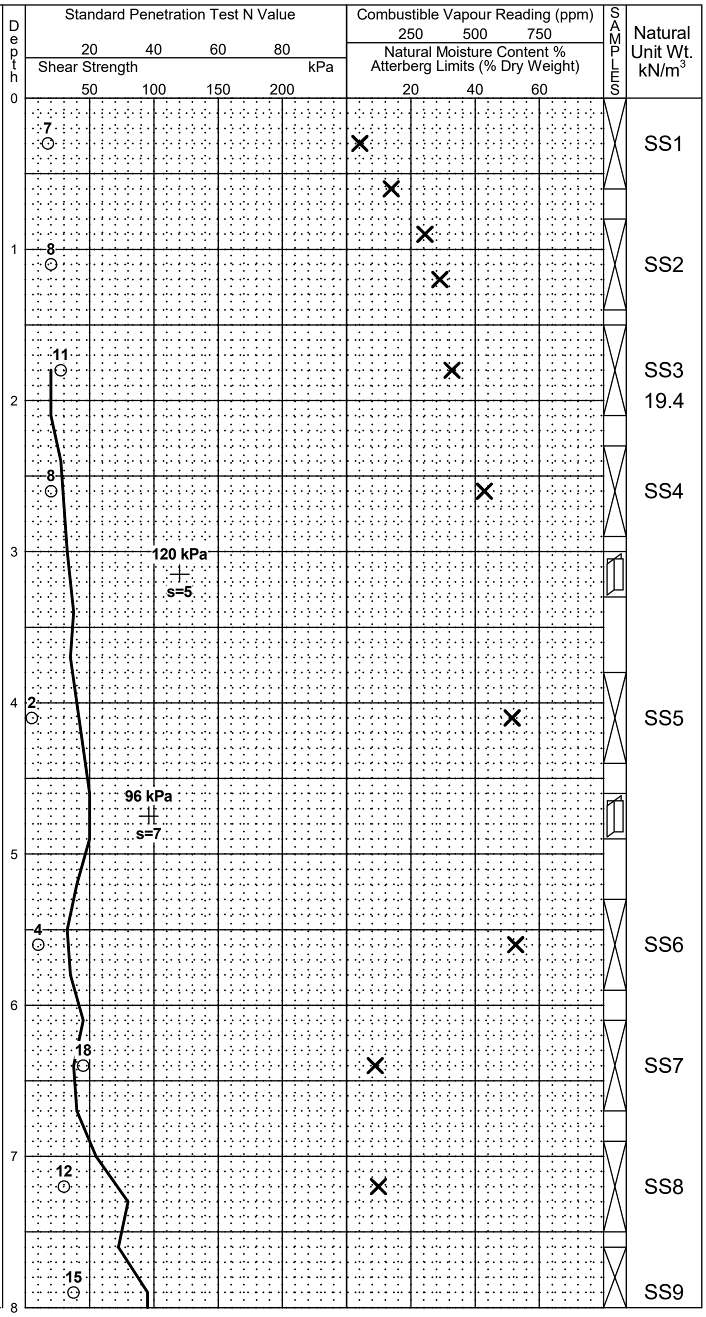
Drill Type: CME-55 Track Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

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
			65.1
		ASPHALTIC CONCRETE ~ 25 mm thick	65.1
	▩	**FILL** Sand and gravel to silty clay with sand, brown, moist, (loose)	64.0
	▨	**SILTY CLAY** Brown, moist, (very stiff)	61.5
	▨	**SILTY CLAY** Medium Plasticity (CI), grey, moist, (very stiff)	59.2
		GLACIAL TILL Silty gravelly sand with clay, cobbles, boulders and shale, grey, wet, (compact)	



Continued Next Page

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. The borehole was backfilled upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23014181-G0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Completion	4.0	4.6

CORE DRILLING RECORD

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

Log of Borehole BH-2

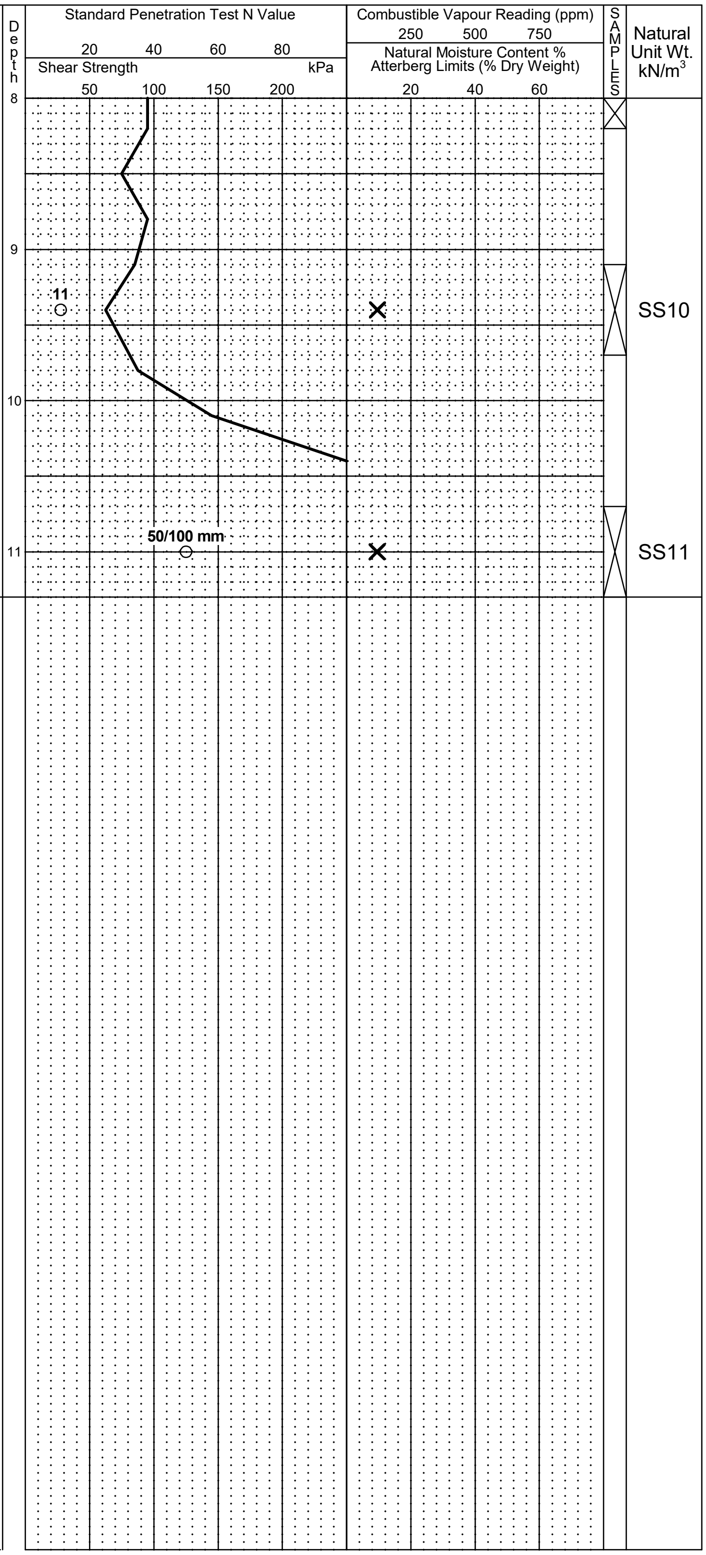
Project No: OTT-23014181-G0

Project: Proposed Residential Development

Figure No. 4

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m
		GLACIAL TILL Silty gravelly sand with clay, cobbles, boulders and shale, grey, wet, (compact) *(continued)*	57.1
			53.8
		Auger Refusal at 11.3 m Depth	



NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. The borehole was backfilled upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23014181-G0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Completion	4.0	4.6

CORE DRILLING RECORD

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

Log of Borehole BH-3

Project No: OTT-23014181-G0

Project: Proposed Residential Development

Location: 1136 Gabriel Street, Ottawa, ON

Figure No. 5

Page. 1 of 1

Date Drilled: 'July 12, 2024

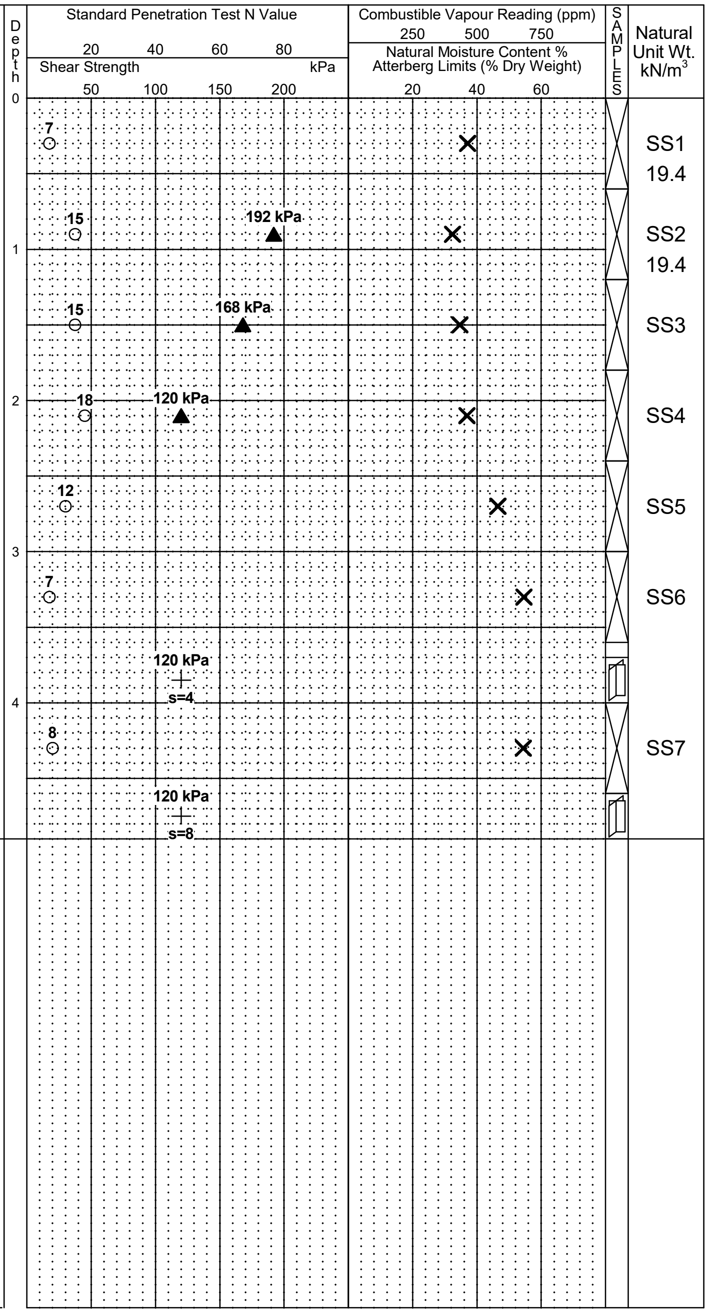
Drill Type: Hand Portable Drilling

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

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 Vane Test	+ S	Shear Strength by Penetrometer Test	▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m
		TOPSOIL ~ 300mm thick	65.1
		SILTY CLAY Brown, moist, (very stiff)	64.8
		SILTY CLAY Grey, moist, (very stiff)	62.1
		Borehole Terminated at 4.9 m Depth	60.2



NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. The borehole was backfilled upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-23014181-G0

WATER LEVEL RECORDS

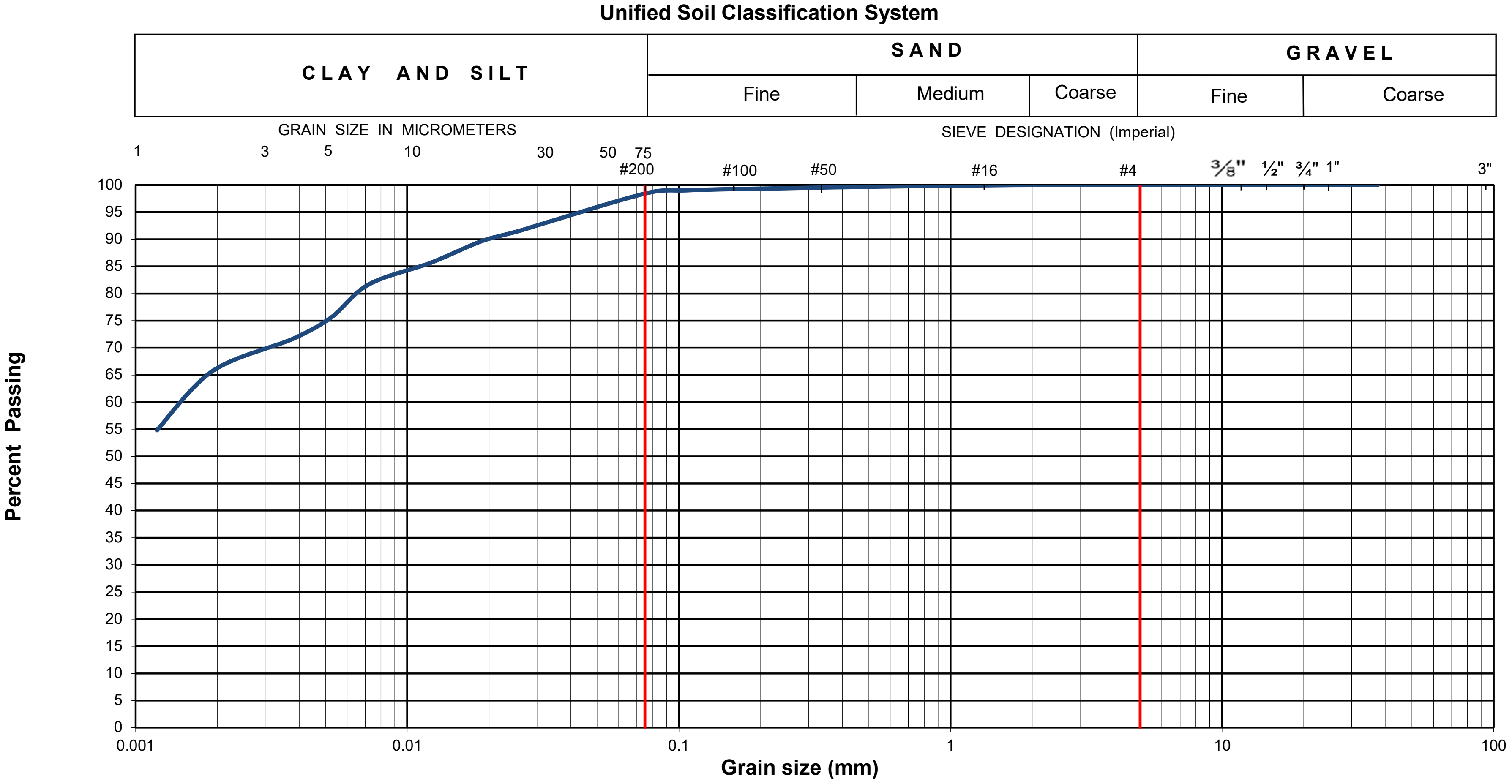
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

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

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

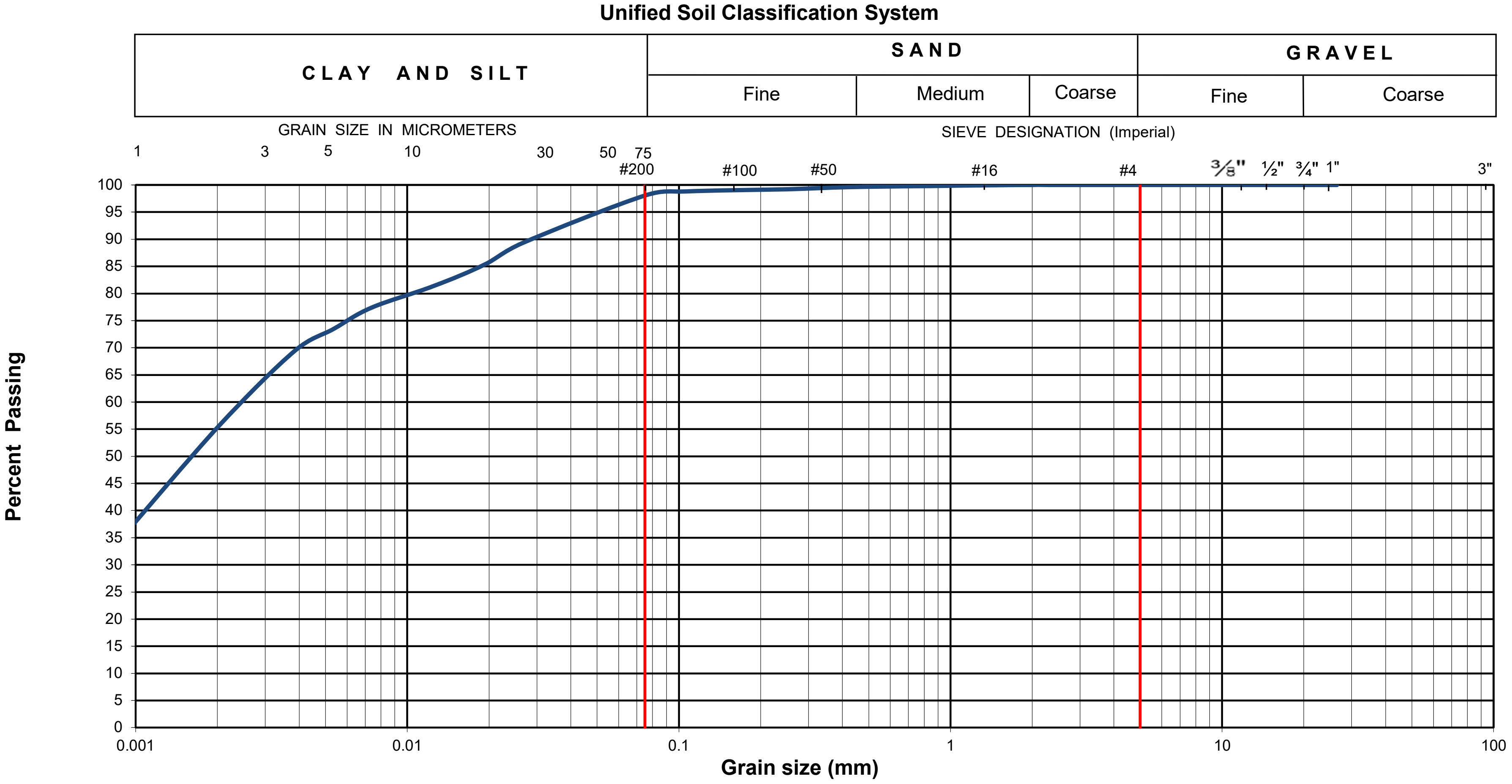
Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136



EXP Project No.:	**OTT-23014181-G0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development.**						
Client :	**PulseSocieties Ltd.**	**Project Location :**	**1136 Gabriel Street, Ottawa**						
Date Sampled :	**July 9, 2024**	**Borehole No:**	**BH1**	**Sample:**	**SS3**			**Depth (m) :**	**1.5 - 2.1**
Sample Composition :		**Gravel (%)**	**0**	**Sand (%)**	**2**	**Silt & Clay (%)**	**98**	**Figure :**	**6**
Sample Description :	**Silty Clay of High Plasticity (CH), trace sand**								

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

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

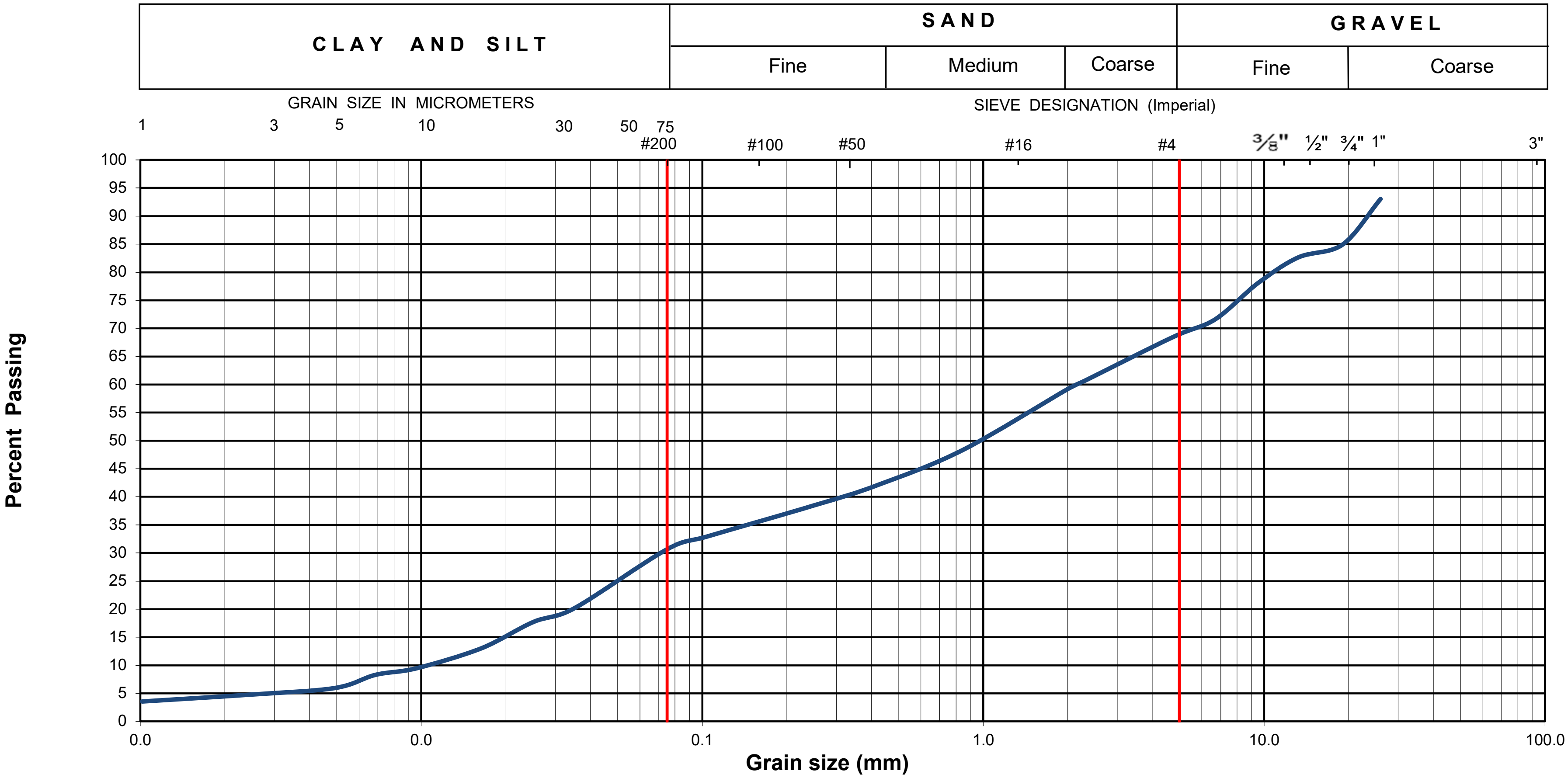


EXP Project No.:	**OTT-23014181-G0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development.**				
Client :	**PulseSocieties Ltd.**	**Project Location :**	**1136 Gabriel Street, Ottawa**				
Date Sampled :	**July 9, 2024**	**Borehole No:**	**BH2**	**Sample:**	**SS5**	**Depth (m) :**	**3.8 - 4.4**
Sample Composition :		**Gravel (%)** 0	**Sand (%)** 2	**Silt & Clay (%)**	**98**	**Figure :**	**7**
Sample Description :	**Silty Clay of Medium Plasticity (CI), trace sand**						

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-23014181-G0**	**Project Name :**	**Geotechnical Investigation - Proposed Residential Development.**						
Client :	**PulseSocieties Ltd.**	**Project Location :**	**1136 Gabriel Street, Ottawa**						
Date Sampled :	**July 9, 2024**	**Borehole No:**	**BH2**	**Sample:**	**SS9**	**Depth (m) :**	**7.6 - 8.2**		
Sample Composition :		**Gravel (%)**	**32**	**Sand (%)**	**41**	**Silt & Clay (%)**	**27**	**Figure :**	**8**
Sample Description :	**Glacial Till - Silty Gravelly Sand (SM), trace clay**								

Appendix A – AGAT Laboratory Certificate of Analysis

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: **Daniel Wall**

PROJECT: **OTT-23014184-G0**

AGAT WORK ORDER: **24Z172440**

SOIL ANALYSIS REVIEWED BY: **Sukhwinder Randhawa, Inorganic Team Lead**

DATE REPORTED: **Jul 18, 2024**

PAGES (INCLUDING COVER): **5**

VERSION*: **1**

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

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.*
- *This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

Certificate of Analysis

AGAT WORK ORDER: 24Z172440
PROJECT: OTT-23014184-G0

CLIENT NAME: EXP SERVICES INC
SAMPLING SITE:1136 Gabriel Street, Ottawa

ATTENTION TO: Daniel Wall
SAMPLED BY:EXP

(Soil) Inorganic Chemistry

DATE RECEIVED: 2024-07-10

DATE REPORTED: 2024-07-18

			SAMPLE DESCRIPTION:	BH1 SS4 (7.5'-9.5')	BH1 SS5 Bottom (10'-12')
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2024-07-09	2024-07-09
Parameter	**Unit**	**G / S**	**RDL**	**5999224**	**5999226**
Chloride (2:1)	µg/g		2	26	32
Sulphate (2:1)	µg/g		2	20	73
pH (2:1)	pH Units		NA	7.67	7.94
Electrical Conductivity (2:1)	mS/cm		0.005	0.419	0.242

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

5999224-5999226 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

Analysis performed at AGAT Toronto (unless marked by *)

Sukhwinder Kaur Randhawa

Skaur

Certified By:

Quality Assurance

CLIENT NAME: EXP SERVICES INC
PROJECT: OTT-23014184-G0
SAMPLING SITE:1136 Gabriel Street, Ottawa

AGAT WORK ORDER: 24Z172440
ATTENTION TO: Daniel Wall
SAMPLED BY:EXP

Soil Analysis

RPT Date: Jul 18, 2024			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Soil) Inorganic Chemistry															
Chloride (2:1)	5998739		14	13	7.4%	< 2	97%	70%	130%	97%	80%	120%	94%	70%	130%
Sulphate (2:1)	5998739		121	120	0.8%	< 2	95%	70%	130%	99%	80%	120%	96%	70%	130%
pH (2:1)	6000301		7.41	7.90	6.4%	NA	88%	80%	120%						
Electrical Conductivity (2:1)	6000301		0.681	0.661	3.0%	< 0.005	111%	80%	120%						

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

Certified By: Sukhwinder Kaur Randhawa Skaur

Method Summary

CLIENT NAME: EXP SERVICES INC

PROJECT: OTT-23014184-G0

SAMPLING SITE:1136 Gabriel Street, Ottawa

AGAT WORK ORDER: 24Z172440

ATTENTION TO: Daniel Wall

SAMPLED BY:EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE

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)

Laboratory Use Only

Work Order #: 24Z172440

Cooler Quantity: One - no ice/packs

Arrival Temperatures: 21.9 | 21.6 | 21.6

Depot Temperatures: 6.3 | 6.1 | 7.2

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes: Bagged Ice

Report Information:

Company: EXP
Contact: Daniel Wall
Address: 2650 Queensview Drive, Suite 100
Ottawa, Ontario, K2B 8H6
Phone: 613-688-1899 Fax:
Reports to be sent to:
1. Email: daniel.wall@exp.com
2. Email: ryan.digiuseppe@exp.com

Regulatory Requirements:

(Please check all applicable boxes)

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

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

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

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

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

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

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

OR Date Required (Rush Surcharges May Apply): ____

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

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

Project Information:

Project: OTT-23014184-G0
Site Location: 1136 Gabriel Street, Ottawa
Sampled By: EXP
AGAT Quote #: ____ PO: ____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Legal Sample ☐

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y / N	O. Reg 153 Metals & Inorganics	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 mSPLP: ☐ Metals ☐ VOCs ☐ SVOCs ☐ DOC	O. Reg 558 Landfill Disposal Characterization TCLP: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Corrosivity: ☐ Moisture ☐ Sulphide	pH	Sulphate	Chloride	Electroc Conductivity			Potentially Hazardous or High Concentration (Y/N)
1. BH1 SS4 (7.5'-9.5')	July 9	AM PM	1															☑	☑	☑	☑			
2. BH1 SS5 Bottom (10'-12')	July 9	AM PM	1															☑	☑	☑	☑			
3.		AM PM																						
4.		AM PM																						
5.		AM PM																						
6.		AM PM																						
7.		AM PM																						
8.		AM PM																						
9.		AM PM																						
10.		AM PM																						
11.		AM PM																						

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	
			C. Griffith	07/10/24	16h41	
CG to Duo	07/11/24	15h00		7/12/24	8:30	Page ____ of ____
						N°:

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

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