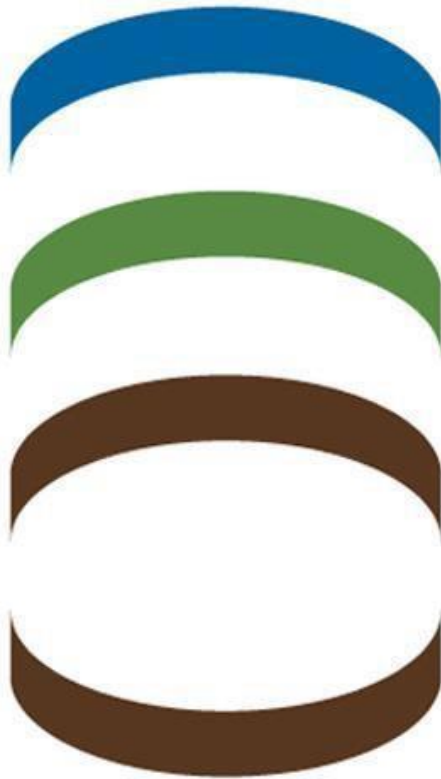
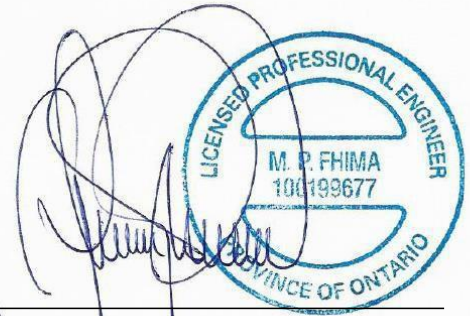


**1199 NEWMARKET HOLDINGS INC.  
GEOTECHNICAL INVESTIGATION**

Property located at 1195, Newmarket Street in Ottawa, Ontario  
N/Ref.: 13340



Prepared by :



**Pascal Fhima, Eng., P. Eng.**  
*President and CEO*

NOVEMBER 2019  
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Original: November 22<sup>nd</sup> 2019

**Mr. Stanley Zipkin**  
**1199 NEWMARKET HOLDINGS INC.**  
A-3488 Côte-des-Neiges Road  
Montreal, Quebec  
H3H 2M6

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**Object: GEOTECHNICAL STUDY**  
Commercial Building of one (1) storey without basement  
Property located at 1195, Newmarket Street in Ottawa, Ontario

**N/Ref: 13340**



Mr. Zipkin,

Following the mandate you granted us, we are pleased to present you our report of the geotechnical study conducted for the Property mentioned above.

We thank you for giving us the opportunity to serve you and hope to engage in future collaborations. Should any further queries arise, please do not hesitate to communicate with us.

Trusting everything is to your complete satisfaction, we remain yours truly.

**GROUPE ORTAM INC.**



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**Pascal Fhima, Eng., P. Eng.**  
*President and CEO*

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## APPENDICES

Appendix 1	Site location and location of boreholes
Appendix 2	Borehole Logs
Appendix 3	Laboratory testing
Appendix 4	Pavement Structural Design Requirements
Appendix 5	Certificate of analysis of soils tested for corrosive action

Symbols and terms used on Borehole and test pit records



## 1. INTRODUCTION

Mr. Stanley Zypkin of 1199 Newmarket Holdings INC. retained the services of GROUPE ORTAM Inc. (ORTAM), in order to carry out a geotechnical study for a commercial building construction project. The proposed site area for the project is located at property located at 1195, Newmarket Street in Ottawa, Ontario. The site location plan is presented in Appendix 1.

The proposed project consists in construction of a commercial building of one (1) storey without basement.

The objective of this geotechnical study in the framework of this mandate was to determine the nature and the properties of the soils as well as the bedrock and the groundwater level, if encountered, in view of the foundation design. This report describes the field and laboratory works conducted, presents the results obtained and provide geotechnical recommendations and general comments relating to the above mentioned project.

The report includes appendices as well: a borehole location plan (Appendix 1), boring log (Appendix 2), laboratory testing results (Appendix 3).

This report is subject to certain limiting conditions that result from the inherent nature of geological, geotechnical and hydrogeological profiles of the sites investigated using boreholes. The scope of the study undertaken and its limitations are elucidated at the end of this report. These limiting conditions make up an integral part of this report and the readers are encouraged to become familiar with these conditions in order to facilitate their understanding, interpretation and use of the present document.



## 2. SITE AND PROJECT DESCRIPTION

### 2.1 SITE DESCRIPTION

The site is located at 1195, Newmarket Street in Ottawa, Ontario. The site is trapezoidal in shape and covers an area of approximately 10 885 square meters (m<sup>2</sup>). The property is currently occupied by a commercial building. Considering the Newmarket Street as oriented East-West, the property is bordered to the North by the railway, to the South by Newmarket Street, to the East and to the West by commercial buildings.

One storey building with no basement is present on the eastern part of the property.

### 2.2 PROJECT DESCRIPTION

The project involves the construction of a commercial building with of one (1) floor without basement.

## 3. METHODS OF INVESTIGATION

### 3.1 FIELD INVESTIGATION

The field work, was carried out on August 27<sup>th</sup>, 2019 and involved the implementation of seven (7) boreholes identified as BH1 to BH7. The location of the boreholes is shown on the enclosed plan (Appendix 1). Boreholes were carried out by means of an auger drill rig to the maximum depth of 6.9 meters below the existing grades. The field work was carried out under the constant supervision of our geotechnical personnel.

The Standard Penetration Test (SPT) is performed by driving a standard split spoon sampler into the ground by blows from a drop hammer of mass 63.5 Kg falling 760 mm. The Sample is driven 600 mm into the soil at the bottom of the borehole, and the number of blows needed for the tube to penetrate each 150 mm up to a depth of 600 mm is recorded. The sum of the number of blows required for the second and third 150 mm of penetration is reported as the SPT blowcount value, commonly termed "Standard Penetration Resistance" or the "N-value". The N-value provides an indication of the relative density of the subsurface granular soil.

The soil samples have been carefully described on site as well as in our laboratory, by a soil specialist.



The field work included a survey of the boreholes and some important points of the site. The reference point (BM) of the survey is the top of the sump of the municipal sewer system located at the corner of Newmarket Street and Bantree street. An arbitrary elevation of 30 m was given to this reference point (see Appendix 1).

All soil samples recovered from the boreholes not used for laboratory tests will be kept for a period of three (3) months from the date of this report, after which they will be destroyed unless otherwise requested by the client.

### **3.2 LABORATORY TESTING**

In order to determine some of the geotechnical characteristics of the soils, and to complete the technical information gathered during fieldwork, the following laboratory testing was carried out on a representative soil sample recovered from the conducted surveys:

- ten (10) sieve analyses;
- three (3) hydrometer analyses;
- two (2) determinations of the liquid and plastic limits (ASTM D4318);
- six (6) chemical analyses for basic chemical analysis related to potential sulphate attack on buried concrete elements and corrosion of buried ferrous elements.

Test results are presented in sections 4 and 5.10 of this report. All the geotechnical laboratory test reports are enclosed in appendices 3 and 5.

## **4. STRATIGRAPHY OF SUBSOIL AND GROUND WATER CONDITIONS**

### **4.1 STRATIGRAPHY OF SUBSOIL**

Details of different soil layers encountered in the borehole locations are presented in the borehole logs in Appendix 2.

In summary, the soils encountered (from the top to the bottom) are described as follows:

#### **4.1.1 FILL MATERIALS**

Fill materials encountered in the boreholes consist mostly of medium dense heterogeneous mixture of sand, silt and gravel. At the location of Borehole BH7, fill materials consist of crushed stone type MG-20. This fill



layer, with a thickness ranges between 0.3 m and 1.8 m, is wet and probably contains stones and blocks. It should be noted that, at some places, the fill material can be deeper or shallower

#### 4.1.2 NATIVE SOIL

##### a) Organic soil

Directly below the fill materials at the location of boreholes BH5, an organic soil was encountered at the depth and elevation shown in table 2. This black layer, with a thickness of 0,3 m is humid.

##### b) Cohesive soil deposit

Beneath the fill layer at the location of boreholes BH1 and BH6, the native soil composed of a clayey silt with traces of sand (BH1) and of a clay and silt with traces of sand (BH6). This cohesive soil is wet, stiff in consistency and has a thickness of 0.5 and 1.9 m, at the location of BH6 and BH1 respectively. A summary of the geotechnical tests performed on the clay deposit are presented in the following Table 1 and 2, while the detailed laboratory results can be found in Appendix 3. This test includes particles size analysis, water content determination (Wn), Atterberg Limits (LL, PL, and IP, IL).

Table 1- Results of sieve and hydrometer analysis tests

Description	Water content (%)	Clay < 2 µm (%)	Silt < 80 µm and > 2 µm (%)	Sand < 5 mm and > 80 µm (%)	Gravel > 5 mm (%)	Sample	Borehole
Clayey silt, traces of sand	36	29	67	3	0	SS-3	BH1
Clay and silt, traces of sans		48	47	5	0	SS2B	BH6

Table 2- Laboratory test results

BOREHOLE N°	SAMPLE N°	DEPTH (M)	Wn (%)	ATTERBERG LIMITS (%)			
				LL	PL	IP	IL
BH2	SS-3	1.20 – 1.80	25	33	22	11	0,2
BH6	CF-2B	1.10 – 1.20	30	51	23	28	02





Based on the Atterberg limits, the deposit has the characteristics of ***a clay with low plasticity (CL)***.

**c) Granular soil deposit**

Directly under the cohesive soil at the location of borehole BH1 and BH6, under the organic soil layer at the location of borehole BH5 and directly under the fill materials at the location of the other boreholes, the native soil encountered at the depth and elevation shown in table 4 is composed mainly of sand and silt with some gravel and traces of clay. This granular soil is saturated and compact to dense in density and has a thickness that ranges between 0.5 (BH6) and 2.6 m (BH4).

Locally at the location of boreholes BH2 and BH3, the upper part of the granular soil is saturated and loose in density. A summary of the geotechnical tests performed on the clay deposit are presented in the following Table 3, while the detailed laboratory results can be found in Appendix 3. These tests include water content and particles size analysis by sieve and by hydrometer.

Table 1 below recapitulates the results obtained and details are presented in Appendix 3 of this report.

Table 3- Results of sieve and hydrometer analysis tests

Borehole	Sample	Gravel > 5 mm (%)	Sand < 5 mm and > 80 µm (%)	Silt < 80 µm and > 2 µm (%)	Clay < 2 µm (%)	Water content, Wn (%)	Description
BH1	SS-4B	0	40	46	14	11.8	Silt and sand, some clay
BH2	SS-4	15	46		40	9.6	Sand and silt, some gravel
BH2	SS-5	30	32		38	7.9	Sandy gravelly silt
BH3	SS-3	2	84		14	16.3	Sand some silt, traces of
BH4	SS-4	4	45		51	11.9	Silt and sand, traces of gravel
BH5	SS-3	15	47		38	8.3	Sand and silt, some gravel
BH6	SS-2A	0	91		9	11.6	Sand, traces of silt
BH7	SS3	15	49		36	-	Sand and silt, some gravel



### 4.1.3 BEDROCK

The bedrock was encountered at the depth and elevation presented in table 1. Samples of the rock recovered as cores are composed of clay limestone with a rock quality designation index (RQD) ranging between 55% and 90%, corresponding to a rock of poor quality to excellent quality.

It should be noted that the bedrock elevations may vary across the site due to irregularity of the bedrock surface.

Table 4 below presents an overview of the depth and elevation of each subsoil stratum encountered at the borehole location.

Table 4- Stratigraphic Summary

BOREHOLE/ ELEVATION	DEPTH AND ELAVATION (m)					END OF BOREHOLE
	FILL DEPOSIT	ORGANIC SOIL	NATURAL INORGANIC SOIL		DEPTH OF BEDROCK	
			COHESIVE SOIL	GRANULAR SOIL (TILL)		
<b>BH1/28.8</b>	0.0–0.3 (28.8–28.5)	-	0.3–2.2 (28.5–26.6)	2.2–4.0 (26.6–24.8)	4,0 (24.8)	6.9 (21.9)
<b>BH2/29.0</b>	0.0–0.3 (29.0–28.7)	-	-	0.3–2.8 (28.7–26.2)	2.8 (26.2)	4.5 (24.5)
<b>BH3/28.8</b>	0.0–1,8 (28.8–27.0)	-	-	1.8–2.4 (27.0–26.4)	2.4 (26.4)	5.4 (23.4)
<b>BH4/29.0</b>	0.0–0.6 (29.0–28.4)	-	-	0.6–3.2 (28.4–25.8)	3.2 (25.8)	4.5 (24.5)
<b>BH5/28.2</b>	0.0–0.9 (28.2–27.3)	0.9–1.2 (27.3–27.0)	-	1.2–1.8 (27.0–26.4)	1.8 (26.4)	3.0 (25.2)
<b>BH6/28.9</b>	0.0–1,1 (28.9–27.8)	-	1.1–1.6 (27.8–27.3)	1.6–2.1 (27.3–26.8)	2.1 (26.8)	2.1 (26.8)
<b>BH7/28.7</b>	0.0–1,8 (28.7–26.9)	-	-	1.8–2.7 (26.9–26.0)	2.7 (26.0)	2.7 (26.0)



## 4.2 GROUNDWATER CONDITIONS

For measuring groundwater levels, five (5) piezometers were installed in boreholes BH1 to BH5. Table 2 below shows the depths and the elevations of water table measured in boreholes BH1 to BH5, in August 2019.

Updated values based on City recommendations – Bench mark **BM** is now: **68.32 meters**

Table 5- Depth and elevation of water table

	WATER LEVEL MEASURED AUGUST, 2019		
	DEPTH (m)	ELEVATION (m)	UPDATED ELEVATION (m) February 2022
BH1 (28.8)	1.6	27.1	66.52
BH2 (29.0)	2.0	27.0	66.32
BH3 (28.8)	1.8	27.0	66.32
BH4 (29.0)	2.1	26.9	66.22
BH5 (28.9)	1.9	27.0	66.32

*It should be noted that groundwater levels are, however, expected to fluctuate and can be found at higher or lower elevations during other periods of the year according to the prevailing weather conditions.*



## 5. DISCUSSION AND RECOMMANDATIONS

It is understood that the proposed project will consist of the construction of commercial building of one (1) floor without basement. Based upon the results obtained from the borehole location and assuming them to be representative at subsurface conditions across the entire site, the following recommendations are offered for the proposed project.

### 5.1 ELEVATIONS

Taking into account the topography of the site and architecture plans, the following elevations are proposed:

▪ <b>Ground level around the building:</b>	<b>68.32 m</b>
▪ Finished ground floor:	68.62 m
▪ Base of the foundations:	66.82 m
▪ Groundwater level (August 2019):	66.42 m
▪ Groundwater level (for calculation):	66.82 m
▪ Depth of bedrock:	between 64.12 and 66.12 m

### 5.2 SPECIFIC GEOTECHNICAL CONCERNS RELATED TO THE SITE

#### 5.2.1 ESSENTIAL PROBLEMS

Specific geotechnical problems related to the site are as follow:

1. The Site is covered with backfill materials that reaches a thickness of 1.8 m at the location of boreholes BH3 and BH7.
2. Presence of an organic soil at the depth of 0.9 m (elevation 66.62 m), in borehole BH5.
3. The bedrock is shallow and at the depth ranging between 1.8 and 4.0 m.
4. The soil at the base of the foundations is heterogeneous. Part of the foundations will be on controlled backfill materials, another part on clayey silt and another again on till deposit.



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## 5.3 FOUNDATIONS SYSTEM

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Given the characteristics of the soil encountered at the location of the boreholes, and assuming these soil conditions are representative of the overall subsurface conditions of the Site, the Site is suitable to support conventional Spread and Strip footing foundations. Part of these foundations will be placed on a clayey silt layer, another one on a till layer or on a controlled backfill layer.

### 5.3.1 SHALLOW FOUNDATIONS

---

Shallow foundations are the very first choice of foundation. They are, first and foremost, cheap and easy to construct compared to other alternatives, such as pile foundations and mat foundations.

Foundations can also be placed directly on the bedrock, encountered between 64.12 and 66.12 meters of depth.

#### 5.3.1.1 Bearing capacity

---

Section 4.1.3 of the "National Building Code 2010" (NBC 2010) requires that the design of foundations is achieved using the limit states method, namely the ultimate limit states (ULS) and serviceability limit states (SLS).

The ultimate limit state defines a limiting stress that should not be exceeded by any conceivable or anticipated loading during the design life of a foundation. The serviceability limit states define a limiting deformation or settlement of a foundation, which, if exceeded, will impair the function of the structure that is supports.

At the ultimate limit state, stresses at the base of foundations, due to factored loads " $\alpha_n S_n$ " should be less than the weighted soil resistance " $\Phi R$ " ( $\alpha_n S_n < \Phi R$ ).

The coefficients  $\alpha_n$  are greater than 1 and the coefficient  $\Phi$  is less than 1.

#### a) Bearing capacity at the ultimate limit state

---

The bearing capacity at the ultimate limit state was calculated using the shear test parameters of cohesion and angle of internal friction and the soil density of the specimens extracted from the boreholes. The following well known Terzaghi equation with correction terms can be used to calculate the ultimate bearing capacity of conventional spread and strip footing foundations.

$$q_{ult} = C N_c S_c + \gamma_o D_f N_q S_q + 0.5 \gamma_1 B N_\gamma S_\gamma$$



$$S_c = S_q = 1 + (B/L)(N_q/N_c) \text{ and}$$

$$S_\gamma = 1 - 0.4(B/L)$$

Where:

$\gamma_0$  - Unit weight of soil above foundation level in  $\text{kN/m}^3$ .

$\gamma_1$  - Unit weight of soil below foundation level in  $\text{kN/m}^3$ .

$C, \phi$  - Strength parameters of the soil below foundation level in  $\text{KN/m}^2$  and degrees respectively.

$B$  - Width of foundation in (m).

$L$  - Length of foundation in (m).

$D_f$  - Depth of foundation (m)

$N_c, N_q, N_\gamma$  - Bearing capacity coefficients dependent on the angle of internal friction of the soil below foundation level.

$S_c, S_q, S_\gamma$  - Correction terms dependent on the geometry of foundations.

The ultimate bearing capacity should be calculated using the following geotechnical parameters.

- $\gamma_0 = 18 \text{ KN/m}^3$ .
- $\gamma_1 = 18 \text{ KN/m}^3$ .
- $C_u = 0 \text{ kPa}$
- $\phi = 32^\circ$ .
- $D_f = 1.5 \text{ m}$
- $N_c - N_q - N_\gamma = 34.3 - 22.1 - 19.5$

The ultimate bearing capacity values presented in table 6 are provided as a guideline for the structural engineer. In Ultimate Limit States design (ULS), the factored ultimate bearing capacity obtained with the factor  $\Phi$  equal to **0.5** must be compared to the design ultimate load combinations. The structural engineer should verify that the design factored load (ultimate load combinations) does not exceed the factored geotechnical resistance ( $\Phi q_{ult}$ ).

Table 3 below shows the values of the bearing capacity at the ULS and SLS, depending on the width of the foundations.

**b) Bearing capacity at the serviceability limit state**

In general, the bearing capacity at the serviceability limit state is the pressure that limits settlements to 25 mm. However, considering the homogeneous of the soil layers, for this specific project, the bearing



capacity at the serviceability limit state indicated in the table 6 below is the stresses that will cause settlements of 30 mm, with differential settlement less than 19 mm.

**Table 6 - Bearing capacity in the Ultimate Limit State (ULS) and Serviceability Limit State (SLS)**

Type of footing	Width (m)	Ultimate limit state (kPa)		Serviceability limit state (kPa)
		Q <sub>ultime</sub>	ULS ( $\phi q_{ultime}$ )	
<b>Strip footing</b>	0.6	350	175	200
	0.9	370	190	160
	1.2	400	200	140
	1.5	430	215	125
	1.8	490	245	110
<b>Spread footing</b>	1.0	544	270	330
	1.2	554	277	275
	1.5	570	285	230
	2.0	596	295	185
	2.5	620	310	160

**Notes:** It is important to note that only the axial loads are considered for these stress levels at the base of the foundation. In the case of the eccentric loads, the eccentricity "e" must be less than one sixth of the width "B" of the foundations ( $e < B/6$ ) and the maximum stress at the base of the foundation must be lower than the bearing capacity in SLS. The bearing capacity is checked by taking into account the fictitious width B equal to:  $B' = B - 2Xe$ .

### 5.3.1.2 Total and differential settlement

For the bearing capacities at the Serviceability Limit State given in Table 3 above, the total settlement could be lower than 25 mm. However, differential settlement will be lower than the allowable value of 19 mm.

### 5.3.1.3 Minimum width of the footing

The minimum width of footings is as follow:



Strip footing :  $B_{\min} = 0.6 \text{ m}$

Spread footing :  $B_{\min} = 1.0 \text{ m}$

#### 5.3.1.4 Reinforced concrete foundations

Due to the characteristics of soil deposits under the foundations and the presence of the clay layer, footings will be of reinforced concrete with reinforcing steel percentage minimum  $\rho_{\min}$  equal to:

$$\rho_{\min} = \frac{1.4}{(A_b)_{\min}} f_y$$

$f_y$  is the ultimate strength of the steel.

$A_a$  and  $A_b$  are respectively the total area of the reinforcement steel and the area of the concrete.

#### 5.4 SLAB ON GRADE

A conventional concrete slab, built on the ground and structurally separated from the foundation walls, can be used in the framework of this project. We recommend the following procedures for the preparation of the ground underneath the slab:

- The fill materials and the organic soils in place should be removed. All disturbed soil beneath the floor slab should also be removed.
- The slab on grade will be brought to the required elevation (see section 5.1) using only well grade granular materials placed in a thin layer not exceeding 300 mm, compacted to at least 95% of the Modified Proctor (PM) of the dry density. The last layer (base course) under the slab will be composed of crushed stones MG-20 of minimal thickness of 300 mm and compacted to a minimum of 95% of the PM.
- The granular materials that will be used as foundation under the slab will have to be DB certified. It should respect the requirements of the Bureau de Normalisation du Québec (BNQ) Standard 2560-500, should not contain any sulphurous minerals such as pyrite and should not consist of shale.
- Before pouring the concrete slab, a polyethylene membrane (0.15 mm thick) should be placed between the concrete and the granular backfill.
- Before pouring the concrete, the exposed grade should be inspected by a qualified soil engineer. Any soft spots or areas of disturbed soil must be removed and replaced with suitable compacted materials.

Following the above recommendation, the slab on grade could be design using a reaction modulus of 45MN/m.





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## 5.5 FROST PROTECTION

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The method recommended in the Canadian Foundation Engineering Manual 4th Edition (2013) was used to estimate the depth of frost penetration in the Ottawa area. This method involves the following modified Bergrenn equation, described by Aldrich (1956), Sanger (1963) and Johnston (1981):

$$X = \lambda \frac{\sqrt{2k_f I_s}}{L_s}$$

Where :

- X = frost penetration deptn;
- Is = freezing index;
- kf = thermal conductivity of the frozen ground;
- Ls = latent heat of the soil;
- λ = coefficient without unit.

The freezing index for Ottawa has been estimated to be 1000 degrees-days Celcius with a standard deviation of 143 degrees-days Celcius, obtained from BNQ 1809-300/2018. Based on this data, the calculated depth of frost will be in order of 1.80 m.

### 5.5.1 Building foundation

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To limit the effects of frost penetration, a minimum depth of soil cover of 1.5 m is required for perimeter footings of heated structures.

### 5.5.2 Underground services

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The underground services should be located below the depth of frost penetration of 1,8m in accordance with City of Ottawa specifications.



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## 5.6 EXCAVATION AND SLOPE STABILITY

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- The contractor will have to take all necessary precautions in order to ensure the stability of the excavation slopes. Based on the borehole results, stable temporary slopes above the groundwater level in the clayey silt soil or fill materials layer could be excavated with slopes of **1V:2H**.
  - Note: For submerged soil, the slope should be **1V:4H**.
- During the excavation, no excavated materials should be piled, nor machinery or equipment be placed, closer than the distance equivalent to the depth of the excavations.
- No vertical un-braced excavations should be performed in the soil.
- The exposed subsoil should be protected against erosion from water runoff or rain.
- An examination of the slopes should be carried out by a qualified geotechnical engineer during the construction. The stability of the slopes remains the responsibility of the contractor.

*Given the fact that the basement will occupy almost the entire area of the property, it will not be possible to respect the safe excavation slopes. Table 5 below shows the Soil parameters for the calculation of the retaining walls.*

## 5.7 SITE DRAINAGE

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All grades must provide effective drainage away from the building during and after construction. This report is based on effective drainage for the life of the building and cannot be relied upon if effective drainage is not maintained. To maintain effective drainage, the contractor should respect the short-term and long-term drainage recommendations.

### 5.7.1 DEWATERING

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Based on the boreholes results, it is anticipated that excavation will be below the groundwater. underground water problems are foreseen for excavations that could exceed 1.6 m below existing grades. Groundwater control during excavation may be achieved by conventional sump pump techniques. However, it should be left to the contractor to determine the methods of dewatering necessary to meet the project requirements.

Dewatering effort will depend on number of factors such as excavation depth, season and weather conditions, the length of time the excavation will be open.



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### 5.7.2 LONG-TERM DRAINAGE

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Since there is no basement, the French drain on the perimeter of the foundation is not required. However, the trench excavation will be backfilled with a free-draining granular material, which may contain less than **5% of fine grained and erodible materials**.

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## 5.8 PROJECT SITE SEISMICITY AND LIQUEFACTION

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### 5.8.1 SITE SEISMIC CONSIDERATION

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As defined by Table 4.1.8.4.A “Site Classification for Seismic Site Response” of the CNBC 2010, the Site classification for seismic response is “C”.

### 5.8.2 LIQUEFACTION POTENTIAL OF SUB-SOILS

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Granular saturated soils tend to lose strength and turn into a liquid-like state when subjected to vibration caused by an earthquake, pile driving or installation of anchors. Given the characteristics of the soil at the base of the foundation, this compact to dense layer of Silt and Till has a low risk of liquefaction.

### 5.8.3 SWELLING AND SHRINKAGE OF THE CLAY LAYER

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During the long periods of dry season, the presence of trees on the site and its surroundings could cause the shrinkage of the clay layer. This will cause differential settlements of shallow foundations. For shallow foundations, the trees should not be planted near the structures (buildings and parking lots).

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## 5.9 WINTER CONSTRUCTION

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The subsoils encountered across the site are frost susceptible and freezing conditions could cause problems for the structure. The following recommendations are presented as preventive measures:

- During winter construction, exposed surfaces meant to support floor slabs must be protected against freezing by means of heating, loose straw and tarpaulins, etc.
- Care must be taken so that the sidewalks or asphalt pavement do not interfere with the opening of doors when the soils are subject to frost heave. This problem may be minimized by any one of several means such as:
  - keeping the doors well above the outside grade,
  - installing a structural slab at the doors,
  - using well-graded backfill and positive drainage.



- The trenches for exterior underground services should be excavated with shallow transition slopes in order to minimize the abrupt change in density between the granular backfill, which is relatively not frost-susceptible, and the more frost-susceptible native soils.

## 5.10 PARKING LOT

---

### 5.10.1 Excavation

---

At the location of the parking areas, all organic soils and fill materials should be excavated, and the structure of pavement must be built in accordance with the recommendations below.

### 5.10.2 FLEXIBLE PAVEMENT

---

LIGHT TRAFFIC (for non-truck) routes the composition should be constructed as follow:

40mm

70mm

150mm granular A

150mm granular B (Subbase is Granular B - Type II as specified in TS 1010)

**For a total of 410mm**

For HEAVY TRAFFIC routes the composition should be constructed as follow:

40mm

120mm

150mm granular A

200mm granular B (Subbase is Granular B - Type II as specified in TS 1010)

**For a total of 510mm**

**Note:**

- 1) *The granular materials of the base course and the wearing course should conform to OPSS 1003 and OPSS 1150 and the hot mix asphalt should be formulated according to MTO Laboratory Testing Manual.*
- 2) *See Appendix 4 for Pavement Structural Design requirements*
- 3) *Trenches for the construction of sumps should be closed with granular materials free from excessive dust (including coatings), clay or silt, and deleterious materials, such as organics, shale, wood etc.*



---

### 5.10.3 LONG TERM DRAINAGE OF PAVEMENT

---

- To minimize the infiltration of surface water into the pavement, a good surface drainage is required. The pavement should be constructed so as to give to the surface of the pavement, a slope of at least 2% to allow drainage of rainwater to sumps.
- The sumps should be installed at appropriate locations and connected to the municipal sewer system.
- Manholes should be installed whenever the drain lines are changed.

### 5.10.4 FROST PROTECTION

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The minimum total thickness of the pavement structures proposed is 770 mm. This structure will provide the recommended partial protection against frost in the Ottawa area for a local type pavement according to the AASHTO criteria.

### 5.11 CORROSION AND CEMENT TYPE

---

- A chemical analysis of the soils found on Site was performed on December 14th, 2021, in order to identify if any special building materials or construction techniques are required to reduce corrosive action on the foundation. Six (6) samples were submitted to EUROFINS Ontario for basic chemical analysis related to potential sulphate attack on buried concrete elements and corrosion of buried ferrous elements. The results of this testing are provided in Appendix 5.
- The results indicate that concrete made with Type GU Portland cement should be acceptable for substructures. The results also indicate a potential for corrosion of exposed ferrous metal.



## 6. QUALITATIVE CONTROL

It is recommended to proceed with a qualitative control of the various steps of the construction in order to ensure the quality of the project.

The excavation work, backfilling and compacting should be supervised in order to ensure that all disturbed soils are adequately excavated at the location of the building and that the controlled fill material is adequate to support the floor slab.

During the construction, vibrations must be controlled to ensure that they are not exceeding the safe limits beyond which liquefaction of the clay layer may cause structural damage to the existing buildings in the vicinity of the construction works.

ORTAM should be retained to provide supervision and testing services during grading, excavation, foundation construction and other geotechnical construction phases of the project.



## 7. LIMITATIONS OF THE INVESTIGATION

The conclusions of the geotechnical investigation are based on the results of the surveys conducted as well as on our present comprehension of the project.

It is important to emphasize that a geotechnical study consists of point sampling of a site and that the recommendations provided derive from the results obtained at the locations of the surveys only.

It is therefore presumed that these soil conditions are representative of the overall subsurface conditions of the site. Consequently, in the event that the conditions encountered during the work differ from those observed at the location of the surveys, we would appreciate to be immediately informed in order to allow us to modify our recommendations accordingly.

It is also recommended that ORTAM be permitted to review the final shop drawings and specifications in order to verify the items of construction related to geotechnical aspects. If not given the privilege of making such a review, ORTAM will assume no responsibility for misinterpretation of the recommendations of this report.

The information contained in this report is meant for geotechnical purposes only and has no bearing on the environmental aspect of the site.

## 8. PERSONNEL

Field work has been performed by J. Martin. This report was written by Pascal Fhima, Senior Engineer.

## 9. QUALIFICATIONS OF THE PERSONNEL

As President, CEO, Mr. Pascal Fhima, Eng., possesses over 21 years' experience in Environmental Site Assessments Phase I, Environmental Site Characterizations Phase II, Environmental Site Rehabilitation Phase IV, Environmental Audit of asbestos/mold/pyrite, Geotechnical studies, Cost evaluation, Building appraisals, Thermography, etc. His credentials include over 150 projects in geotechnical engineering and materials science, beyond 1000 projects in building science and over 5,000 environmental projects, completed since the establishment of ORTAM GROUP INC. (ORTAM).



## 10. REFERENCES

1. Canadian Foundation Engineering Manuel, 4th edition, 2006";
2. Code national du bâtiment
3. Denis Leboeuf, cours GCI-10199, Reconnaissance des sols, Conception et calcul des fondations superficielles, Université Laval, Département de génie civil, septembre 2002.
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5. Vincent Robitaille, Denis Tremblay, *Mécanique des sols, Théorie et Pratiques*, Modulo, 1997
6. Muni Budhu, Soil Mechanics and Foundations, 2<sup>nd</sup> edition, 2007
7. Robert D. Holtz, William D. Kovacs, traduit par Jean Lafleur, *Introduction à la géoetchnique*, édition de l'école Polytechnique de Montréal, août 1996.
8. Serges Leroueil, Tavenas, F. et Bihan, J-P, *Propriétés caractéristiques des argiles de l'Est du Canada*, Revue canadienne de géotechnique, vol. 4, novembre 1983, pp 681-705;
9. Silvestri Vincenzo, Cours 3420, Fondation et mécanique des sols, École Polytechnique de Montréal, Département de génie civil, janvier 1984;
10. Ontario Provincial Standard Specifications, Material
  - OPSS 1003 Aggregates - Hot Mix Asphalt
  - OPSS 1101 Performance Graded Asphalt Cement
  - OPSS 1103 Emulsified Asphalt
  - OPSS 1150 Hot Mix Asphalt
  - OPSS 1151 Superpave and Stone Mastic Asphalt Mixtures
11. Ontario Ministry of Transportation Publications
  - MTO Laboratory Testing Manual:**
  - LS-261 Preparation of Marshall Specimens
  - LS-262 Bulk Relative Density of Compacted Bituminous Mixtures
  - LS-263 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
  - LS-264 Theoretical Maximum Relative Density of Bituminous Paving Mixtures
  - LS-265 Percent Air Voids in Compacted Dense Bituminous Pavement Mixtures
  - LS-282 Quantitative Extraction of Asphalt Cement and Analysis of Extracted Aggregate from Bituminous Paving Mixtures
  - LS-287 The Determination of Percent Compaction of Compacted Bituminous Paving Mixture (MRD Method)
  - LS-292 Quantitative Determination of Asphalt Cement Content by Ignition and Analysis of Remaining Aggregate from Bituminous Paving Mixtures
  - LS-306 Bulk Relative Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
12. ASTM International
  - D 6752-03e1 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method





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**13. American Association of State Highway and Transportation Officials (AASHTO)**

M320-05 Standard Specification for Performance Graded Asphalt Binder

M323-07 Standard Specification for Superpave Volumetric Mix Design

T166-07 Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens

T209-05 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

T275-07 Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens



## APPENDICES



## APPENDIX 1

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- ❖ Site location
- ❖ Location of boreholes

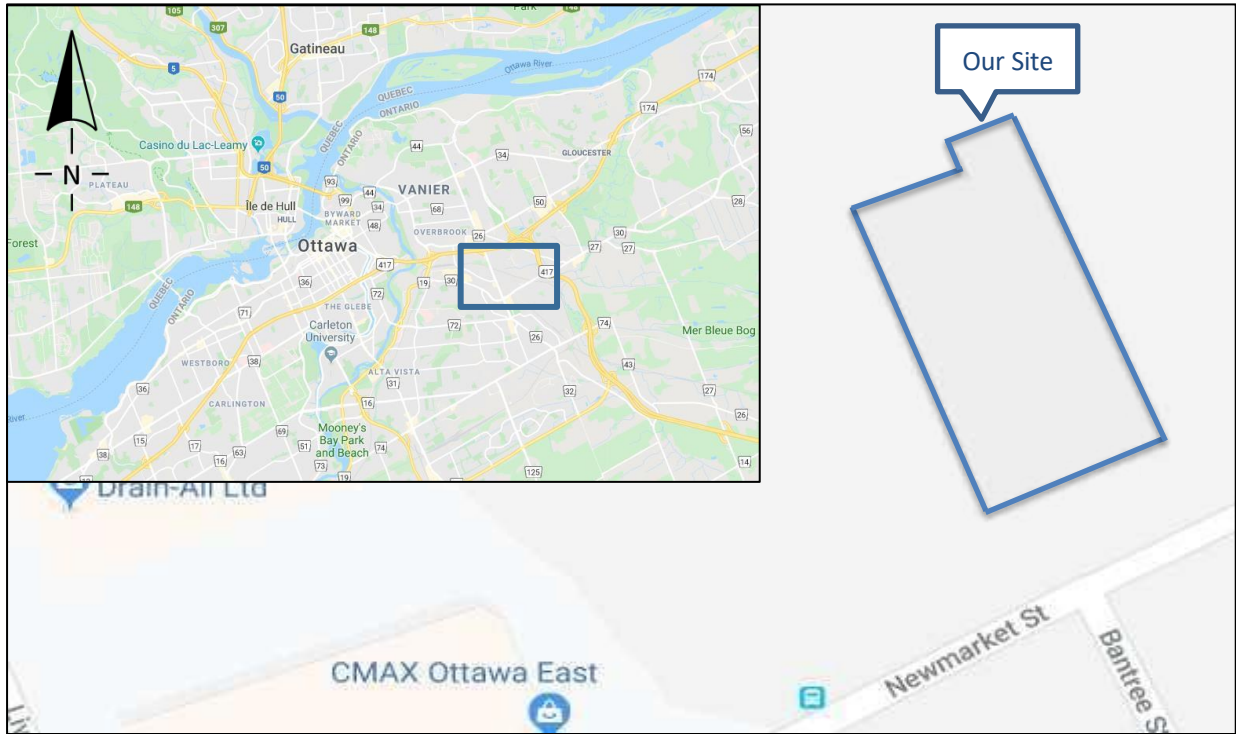


**SITE LOCATION**

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## GENERAL SITE LOCATION



**LOCATION OF BOREHOLES**

---





Photo by Google map

Legend

— Property limit

⊙ - Boreholes proposed by ORTAM in May, 2022  
 F1 to F4 : 8 m of depth with pen test  
 F5 to F8 : 3 m of depth

**NOT FOR CONSTRUCTION**

Sources

- This plan was completed based on the site plan.

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 T. (514) 982-0990  
 F. (514) 982-0890  
 www.ortamgroupe.com

Project

**GEOTECHNICAL STUDY**

Property located at 1195 Newmarket Street in Ottawa, ON

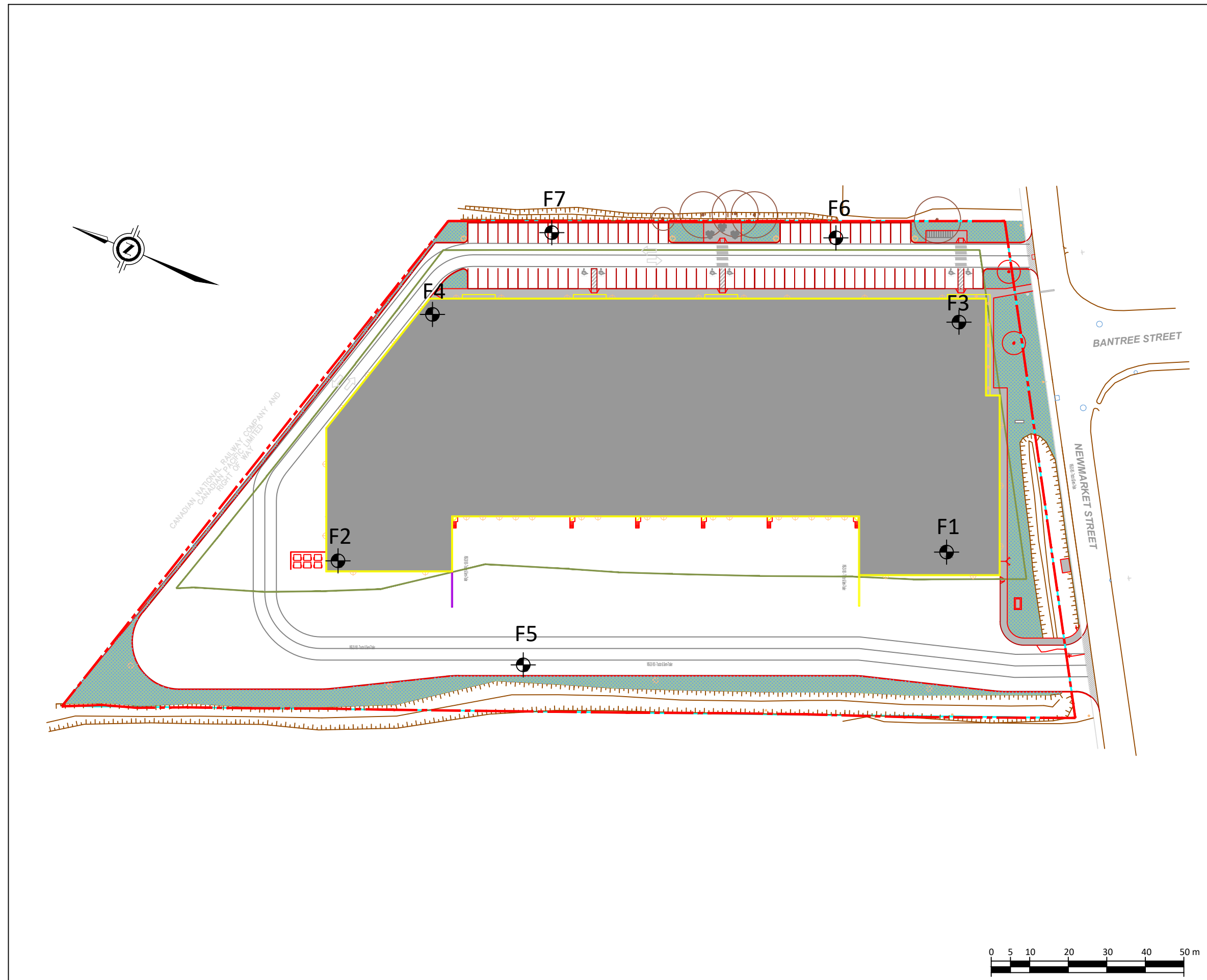
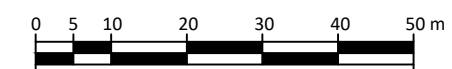
Client

**1199 NEWMARKET HOLDINGS INC.**  
 A-3488, Côte-des-Neiges Road, Montreal, Quebec H3H 2M6

Prepared :	P. Fhima Eng.	O/Ref.:	18551
Drawing :	H.Sun	File name :	D07-12-21-0114
Verified :	P. Fhima Eng.	Date :	05-04-2022
Accepted :	P. Fhima Eng.	Scale :	1 : 1000

Drawing title  
**SURVEY LOCATION**

Figure  
**1**



**APPENDIX 2**

---

❖ Boreholes

Logs





**Projet : Warehouse Newmarket**  
**Site : 1195, Newmarket street, Ottawa**

**Forage no.:** F-1  
**Date :** 2019-08-27  
**Équipement :** Foreuse à tarière Mobile Drill  
**Supervisé par :** D. Héon

Type d'échantillon	État de l'échantillon	Graphique	Évidence de contamination
CF : Cuillère fendue	Remanié	▲ : N (pen. standard)	Olfactive/Visuelle
TM : Tube à paroi mince	Intact	△ : Nc (pen. dynamique)	Inexistant
TE : Tube d'échantillonnage	Perdu	▼ : C <sub>u</sub> (laboratoire)	Faible
CR : Carottage au diamant	Forage au diamant	▽ : C <sub>u</sub> (laboratoire)	Moyen
VR : Manuel		● : C <sub>u</sub> (chantier)	Fort
		○ : C <sub>u</sub> (chantier)	









Coordonnées	Niveau d'eau		
	Date	Niveau	Élev.
Arbitraire	2019-09-02	1,6 m	27,1 m
X : ---			
Y : ---			
Z : 28,8 m			

PROFONDEUR - m	STRATIGRAPHIE		SYMBOLE	NIVEAU D'EAU - m	ÉCHANTILLONS				N ou Nc (coups/300 mm)	RÉSISTANCE AU CISAILEMENT NON-DRAINÉ (kPa)	ESSAIS DE LABORATOIRE et RÉSULTATS IN SITU	TENEUR EN EAU et LIMITES (%)
	NIVEAU - m	PROF. - m			DESCRIPTION	TYPE et NUMÉRO	ÉTAT	SOUS-ÉCHANTILLON				
	28,8		Surface du sol actuel									
	0,0	28,6	Asphalte (120 mm).									
	0,1	28,5	Remblai : Sable avec un peu de silt, d'argile et de gravier. Traces de sols organiques.		CF-1	A	50	20				
	0,3		Silt argileux avec traces de sable. Turquoise. Oxydé. Humide. Consistance ferme.		CF-2		100	9				
1					CF-3		100	11				
	26,6	2,2	Till : Silt et sable avec un peu d'argile. Gris. Saturé. Compacité moyenne à très dense.	1,6 m	CF-4	A	65	24			IP = 11 AG	
					CF-5	B	50	22			AG	
					CF-6		100	R				
4	24,8	4,0	Roc : Calcaire argileux. Bonne à excellente qualité.		CF-7		100	R				
					CR-1		90	85				
					CR-2		100	90				
7	21,9	6,9	Fin du forage.									

REMARQUES : Tube ouvert installé à 6,6 m de profondeur.

**Projet : Warehouse Newmarket**  
**Site : 1195, Newmarket street, Ottawa**

**Forage no.:** F-2  
**Date :** 2019-08-27  
**Équipement :** Foreuse à tarière Mobile Drill  
**Supervisé par :** D. Héon

<b>Type d'échantillon</b> CF : Cuillère fendue TM : Tube à paroi mince TE : Tube d'échantillonnage CR : Carottage au diamant VR : Manuel	<b>État de l'échantillon</b>  Remanié  Intact  Perdu  Forage au diamant	<b>Graphique</b> ▲ : N (pen. standard) △ : Nc (pen. dynamique) ▼ : C <sub>u</sub> (laboratoire) ▽ : C <sub>u</sub> (laboratoire) ● : C <sub>u</sub> (chantier) ○ : C <sub>u</sub> (chantier)	<b>Évidence de contamination</b> Olfactive/Visuelle  Inexistant  Faible  Moyen  Fort	<b>Coordonnées</b> Arbitraire X : --- Y : --- Z : 29,0 m	<b>Niveau d'eau</b>		
					Date	Niveau	Élev.
		2019-09-02	2,0 m	27,0 m			

PROFONDEUR - m	STRATIGRAPHIE			ÉCHANTILLONS						N ou Nc (coups/300 mm)	ESSAIS DE LABORATOIRE et RÉSULTATS IN SITU	TENEUR EN EAU et LIMITES (%)		
	NIVEAU - m	DESCRIPTION	SYMBOLE	TYPE et NUMÉRO	ÉTAT	SOUS-ÉCHANTILLON	RECUPÉRATION	N, Nc ou RQD	OLFACTIF				VISUEL	RÉSISTANCE AU CISAILEMENT NON-DRAINÉ (kPa)
29,0	0,0	Surface du sol actuel												
	28,7	Remblai de till : Sable et silt graveleux. Brun. Compacité très dense.		CF-1	A		85	66						
	0,3	Sable et silt avec traces d'argile et de gravier. Brun. Oxydé. Humide. Compacité lâche.		CF-2	B		65	8						
1	27,8	Till : Sable et silt avec un peu de gravier. Gris. Humide et localement saturé. Compacité moyenne à très dense.		CF-3			85	24						
	27,2	Devient gris.		CF-4			85	42				AG		
2	26,6	Devient silt sableux et graveleux.		CF-5			100	R				AG		
	26,2													
3	2,8	Roc : Calcaire argileux. Mauvaise à moyenne qualité.		CR-1			90	55						
				CR-2			100	45						
4	24,5	Fin du forage.												
5	4,5													
6														
7														

REMARQUES : Tube ouvert installé à 4,2 m de profondeur.



**Projet : Warehouse Newmarket**  
**Site : 1195, Newmarket street, Ottawa**

**Forage no.:** F-4

**Date :** 2019-08-27

**Équipement :** Foreuse à tarière Mobile Drill

**Supervisé par :** D. Héon

**Type d'échantillon**

CF : Cuillère fendue  
 TM : Tube à paroi mince  
 TE : Tube d'échantillonnage  
 CR : Carrotage au diamant  
 VR : Manuel

**État de l'échantillon**

Remanié  
 Intact  
 Perdu  
 Forage au diamant

**Graphique**

▲ : N (pen. standard)  
 △ : Nc (pen. dynamique)  
 ▼ : C<sub>u</sub> (laboratoire)  
 ▽ : C<sub>w</sub> (laboratoire)  
 ● : C<sub>u</sub> (chantier)  
 ○ : C<sub>w</sub> (chantier)

**Évidence de contamination**  
 Olfactive/Visuelle

Inexistant  
 Faible  
 Moyen  
 Fort

**Coordonnées**

Arbitraire  
 X : ---  
 Y : ---  
 Z : 29,0 m

**Niveau d'eau**









Date	Niveau	Élev.
2019-09-02	2,1 m	26,9 m





PROFONDEUR - m	STRATIGRAPHIE			ÉCHANTILLONS						N ou Nc (coups/300 mm)	RÉSISTANCE AU CISAILEMENT NON-DRAINÉ (kPa)	ESSAIS DE LABORATOIRE et RÉSULTATS IN SITU	TENEUR EN EAU et LIMITES (%)	
	NIVEAU - m	PROF. - m	DESCRIPTION	SYMBOLE	NIVEAU D'EAU - m	TYPE et NUMÉRO	ÉTAT	SOUS-ÉCHANTILLON	RECUPÉRATION					N, Nc ou RQD
29,0	0,0		Surface du sol actuel											
	0,0	28,4	Remblai granulaire : Sable et gravier silteux. Brun. Compacité très dense.		CF-1	Remanié		100	76					
	0,6	27,8	Sable et silt avec traces d'argile et de gravier. Brun. Oxydé. Humide à très humide. Compacité moyenne.		CF-2	Intact		65	12					
	1,2	27,2	Till : Silt et sable avec traces de gravier. Gris. Saturé. Compacité moyenne à très dense.		CF-3	Intact		50	23					
	1,8		Deviens très humide.		CF-4	Intact		65	40				AG	
					CF-5	Intact		100	61					
	25,8	3,2	Partie supérieure du roc. Friable.		CF-6	Intact		100	R					
					CF-7	Remanié		35	R					
	24,5	4,5	Fin du forage. Refus sur le roc sain probable.		CF-8	Intact		100	R					

REMARQUES : Tube ouvert installé à 4,2 m de profondeur.

**Projet : Warehouse Newmarket**  
**Site : 1195, Newmarket street, Ottawa**

**Forage no.:** F-5  
**Date :** 2019-08-27  
**Équipement :** Foreuse à tarière Mobile Drill  
**Supervisé par :** D. Héon

<b>Type d'échantillon</b> CF : Cuillère fendue TM : Tube à paroi mince TE : Tube d'échantillonnage CR : Carrotage au diamant VR : Manuel	<b>État de l'échantillon</b>  Remanié  Intact  Perdu  Forage au diamant	<b>Graphique</b> ▲ : N (pen. standard) △ : Nc (pen. dynamique) ▼ : C <sub>u</sub> (laboratoire) ▽ : C <sub>u</sub> (laboratoire) ● : C <sub>u</sub> (chantier) ○ : C <sub>u</sub> (chantier)	<b>Évidence de contamination</b> Olfactive/Visuelle  Inexistant  Faible  Moyen  Fort	<b>Coordonnées</b> Arbitraire X : --- Y : --- Z : 28,2 m				
				<b>Niveau d'eau</b> <table border="1"> <tr> <th>Date</th> <th>Niveau</th> <th>Élev.</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>			Date	Niveau
Date	Niveau	Élev.						









PROFONDEUR - m	STRATIGRAPHIE			SYMBOLE	NIVEAU D'EAU - m	ÉCHANTILLONS					N ou Nc (coups/300 mm) 50 100	RÉSISTANCE AU CISAILEMENT NON-DRAINÉ (kPa) 50 100	ESSAIS DE LABORATOIRE et RÉSULTATS IN SITU	TENEUR EN EAU et LIMITES (%) w <sub>p</sub> w w <sub>L</sub> 20 40 60 80	
	NIVEAU - m	PROF. - m	DESCRIPTION			TYPE et NUMÉRO	ÉTAT	SOUS-ÉCHANTILLON	RECUPÉRATION	N. Nc ou RQD					OLFACTIF
28,2	0,0	28,2	Surface du sol actuel												
	0,0	27,3	Remblai granulaire : Sable et silt graveleux. Brun. Compacité très dense.			CF-1	×	65	64						
1	0,9	27,0	Terre végétale. Brun foncé.			CF-2	×	35	9						
	1,2	26,4	Till : Sable et silt avec un peu de gravier. Gris. Saturé. Compacité moyenne à très dense.		1,5	CF-3	×	85	R				AG	<input type="checkbox"/>	
2	1,8	26,4	Partie supérieure du roc.			CF-4	×	50	R						
	25,2	3,0	Fin du forage.			CF-5	×	50	R						
3															
4															
5															
6															
7															

REMARQUES : Nappe phréatique estimée : 1,5 m (élévation : 26,7 m).



**Projet : Warehouse Newmarket**  
**Site : 1195, Newmarket street, Ottawa**

**Forage no.:** F-7  
**Date :** 2019-08-27  
**Équipement :** Foreuse à tarière Mobile Drill  
**Supervisé par :** D. Héon

<b>Type d'échantillon</b> CF : Cuillère fendue TM : Tube à paroi mince TE : Tube d'échantillonnage CR : Carottage au diamant VR : Manuel	<b>État de l'échantillon</b>  Remanié  Intact  Perdu  Forage au diamant	<b>Graphique</b> ▲ : N (pen. standard) △ : Nc (pen. dynamique) ▼ : C <sub>u</sub> (laboratoire) ▽ : C <sub>u</sub> (laboratoire) ● : C <sub>u</sub> (chantier) ○ : C <sub>u</sub> (chantier)	<b>Évidence de contamination</b> Olfactive/Visuelle  Inexistant  Faible  Moyen  Fort	<b>Coordonnées</b> Arbitraire X : --- Y : --- Z : 28,7 m				
				<b>Niveau d'eau</b> <table border="1"> <tr> <th>Date</th> <th>Niveau</th> <th>Élev.</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>			Date	Niveau
Date	Niveau	Élev.						

PROFONDEUR - m	STRATIGRAPHIE			SYMBOLE	NIVEAU D'EAU - m	ÉCHANTILLONS					N ou Nc (coups/300 mm) 50 100	RÉSISTANCE AU CISAILEMENT NON-DRAINÉ (kPa) 50 100	ESSAIS DE LABORATOIRE et RÉSULTATS IN SITU	TENEUR EN EAU et LIMITES (%) w <sub>p</sub> w w <sub>L</sub> 20 40 60 80	
	NIVEAU - m	PROF. - m	DESCRIPTION			TYPE et NUMÉRO	ÉTAT	SOUS-ÉCHANTILLON	RECUPÉRATION	N. Nc ou RQD					OLFACTIF
28,7	0,0	Surface du sol actuel				CF-1	×	100	R						
28,1	0,6	Remblai : Sable et silt avec un peu de gravier. Brun. Humide. Compacité dense.				CF-2	×	50	36						
26,9	1,8	Till : Sable et silt avec un peu de gravier. Gris. Humide. Compacité très dense.			1,5	CF-3	×	100	37				AG		
26,0	2,7	Fin du forage. Refus sur le roc probable.				CF-4	×	85	51						
						CF-5	×	100	R						

REMARQUES : Nappe phréatique estimée : 1,5 m (élévation : 27,2 m).

**DESCRIPTION ET CLASSIFICATION DES SOLS ET DU ROC :**

**CLASSIFICATION**

Argile	<0,002 mm
Silt	0,002 a 0,08 mm
Sable	0,08 a 5 mm
Gravier	5 a 80 mm
Cailloux	80 a 300 mm
Blocs	> 300 mm

**TERMINOLOGIE**

"traces"	< 10 %
"un peu"	10-20 %
adjectif (silteux, sableux)	20-35 %
nom (silt, sable)	> 35 %

**COMPACTITE DES SOLS GRANULAIRES**      **INDICE DE PENETRATION STANDARD "N"**  
(coups/300 mm)

Tres lache	< 4
Lache	4-10
Compact ou moyenne	10-30
Dense	30-50
Tres dense	> 50

**CONSISTANCE DES SOLSCOHERENTS**      **RESISTANCE AU CISAILLEMENT  $C_u$**   
(kPa)

Tres molle	< 12
Molle	12-25
Ferme	25-50
Raide	50-100
Tres raide	100-200
Dure	> 200

**INDICE DE LA QUALITE DU ROC**

VALEUR "RQD"	QUALITATIF
< 25	tres mauvais
25-50	mauvais
50-75	moyen
75-90	bon
> 90	excellent

**ELEVATION :**

Niveau geodesique ou arbitraire du terrain a l'emplacement du sondage. Le point geodesique ou arbitraire utilise est defini dans le rapport.

**PROFONDEUR :**

Profondeur des differents contacts geologiques a partir de la surface du terrain.



**STRATIGRAPHIE :**

Chaque formation geologique est decrite selon la terminologie d'usage. Le contact entre les formations geologiques est identifie par une ligne pleine lorsque la profondeur est bien definie ou par une ligne en pointille. La precision du contact est relatif a la methode d'echantillonnage et le pourcentage de recuperation.

**ECHANTILLONS :**

ETAT

La position, la longueur et l'etat de chaque echantillon sont montres dans cette colonne. Les symboles suivants sont utilises pour definir l'etat de l'echantillon.



: Remanie



: Intact



: Perdu



: Carotte de roc

TYPE ET NUMERO

Le type d'echantillonneur utilise est defini par l'abreviation indique ci-apres. La numerotation est continue pour chacun des types.

CF : Cuillere fendue

TM : Tube a paroi mince

VR : Vrac

TE : Tube d'echantillonnage

CR : Carottier diamante

CFE, VRE, TEE : Echantillonnage environnemental

**ESSAIS DE CHANTIER :**

N : Indice de penetration standard

$N_C$  : Indice de penetration dynamique au cone

R : Refus a l'enfoncement

$C_u$  : Resistance au cisaillement non draine

k : permeabilite

RQD : Indice de la qualite du roc

**RECUPERATION :**

La recuperation de l'echantillon est le rapport exprime en pourcentage de la longueur recuperee dans l'echantillonneur a la longueur enfoncee.

**RESULTATS DES ESSAIS :**

Cette colonne contient a la profondeur correspondante, les essais effectues au chantier ou en laboratoire. Les resultats de ces essais sont soit presentes dans cette colonne, dans le rapport ou dans les certificats des essais de laboratoire.

**ESSAIS DE LABORATOIRE :**

$I_p$  : Indice de plasticite

AG : Analyse granulo-sedimentometrique

CS : Cone Suedois

$w_L$  : Limite liquide

w : Teneur en eau

CHIM : Analyse chimique

$w_p$  : Limite plastique

$\gamma$  : Poids volumique

$\sigma_p'$  : Pression de preconsolidation

**APPENDIX 3**

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❖ Laboratory testing results



**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-1

**DONNÉES GÉNÉRALES**

Description: Silt argileux avec traces de sable	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-1 / CF-3	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5	0,057	95,9
56 mm	100	1	0,041	94,1
40 mm	100	2	0,029	91,0
28 mm	100	5	0,019	82,3
20 mm	100	15	0,011	68,7
14 mm	100	30	0,008	57,5
10 mm	100	60	0,006	48,9
5 mm	100	120	0,004	41,5
2,5 mm	100	240	0,003	34,7
1,25 mm	100	480	0,002	31,6
630 µm	100	1440	0,001	24,1
315 µm	100			
160 µm	100			
80 µm	96,8			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	29
Silt %	67
Sable %	3
Gravier %	0

**REMARQUES**

Teneur en eau : 36 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

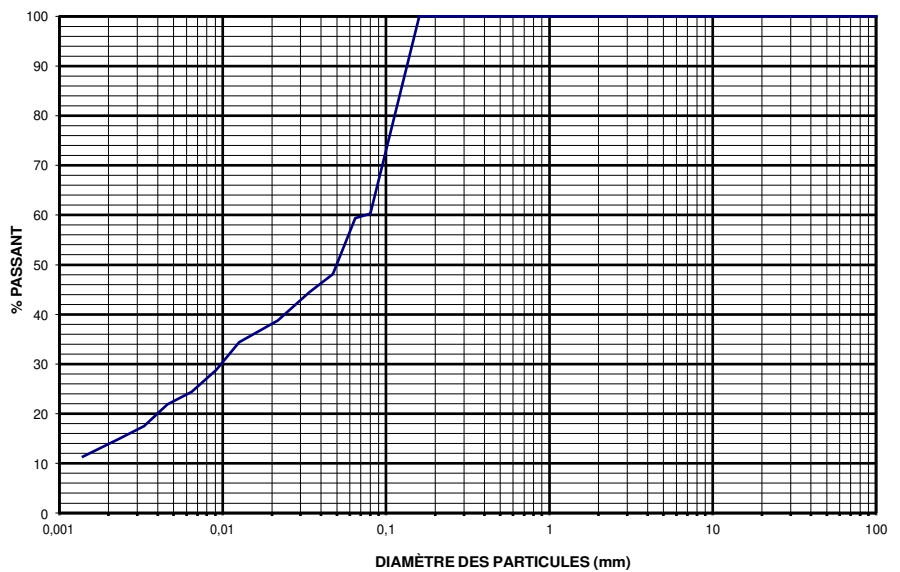
**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-2

**DONNÉES GÉNÉRALES**

Description: Silt et sable avec un peu d'argile	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-1 / CF-4B	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5	0,065	59,4
56 mm	100	1	0,047	48,1
40 mm	100	2	0,034	44,4
28 mm	100	5	0,022	38,8
20 mm	100	15	0,013	34,4
14 mm	100	30	0,009	28,8
10 mm	100	60	0,006	24,4
5 mm	100	120	0,005	21,9
2,5 mm	100	240	0,003	17,5
1,25 mm	100	480	0,002	15,0
630 µm	100	1440	0,001	11,3
315 µm	100			
160 µm	100			
80 µm	60,3			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	14
Silt %	46
Sable %	40
Gravier %	0

**REMARQUES**

Teneur en eau : 11,8 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

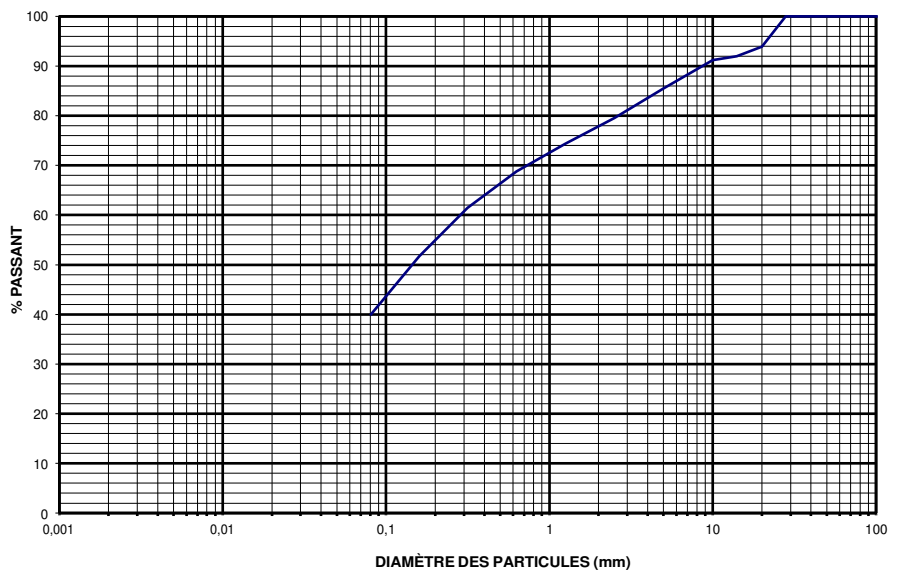
**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-3

**DONNÉES GÉNÉRALES**

Description: Sable et silt avec un peu de gravier	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-2 / CF-4	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	94	15		
14 mm	92	30		
10 mm	91	60		
5 mm	85	120		
2,5 mm	80	240		
1,25 mm	74	480		
630 µm	69	1440		
315 µm	61			
160 µm	52			
80 µm	39,8			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	40
Sable %	46
Gravier %	15

**REMARQUES**

Teneur en eau : 9,6 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.

**DOSSIER:** 13340

**PROJET:** 1195, Newmarket street, Ottawa

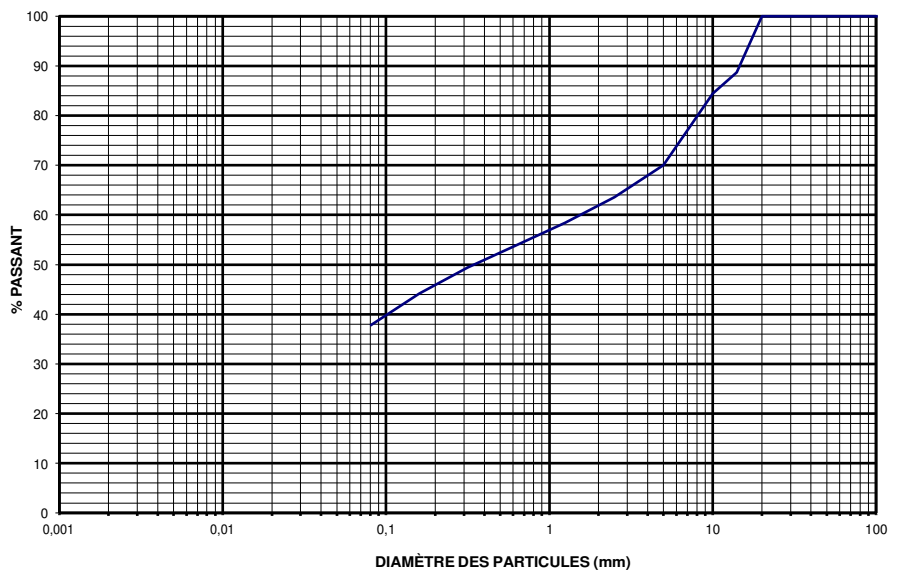
**ANALYSE NO:** 19-478-4

**DONNÉES GÉNÉRALES**

Description: Silt sableux et graveleux	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-2 / CF-5	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	100	15		
14 mm	89	30		
10 mm	84	60		
5 mm	70	120		
2,5 mm	64	240		
1,25 mm	58	480		
630 µm	54	1440		
315 µm	49			
160 µm	44			
80 µm	37,7			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	38
Sable %	32
Gravier %	30

**REMARQUES**

Teneur en eau : 7,9 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-5

**DONNÉES GÉNÉRALES**

Description: Sable avec un peu de silt et traces de gravier	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-3 / CF-3	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	100	15		
14 mm	100	30		
10 mm	99	60		
5 mm	98	120		
2,5 mm	96	240		
1,25 mm	93	480		
630 µm	83	1440		
315 µm	62			
160 µm	31			
80 µm	13,8			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	14
Sable %	84
Gravier %	2

**REMARQUES**

Teneur en eau : 16,3 %

CLIENT: 1199 NEWMARKET HOLDINGS INC.

DOSSIER: 13340

PROJET: 1195, Newmarket street, Ottawa

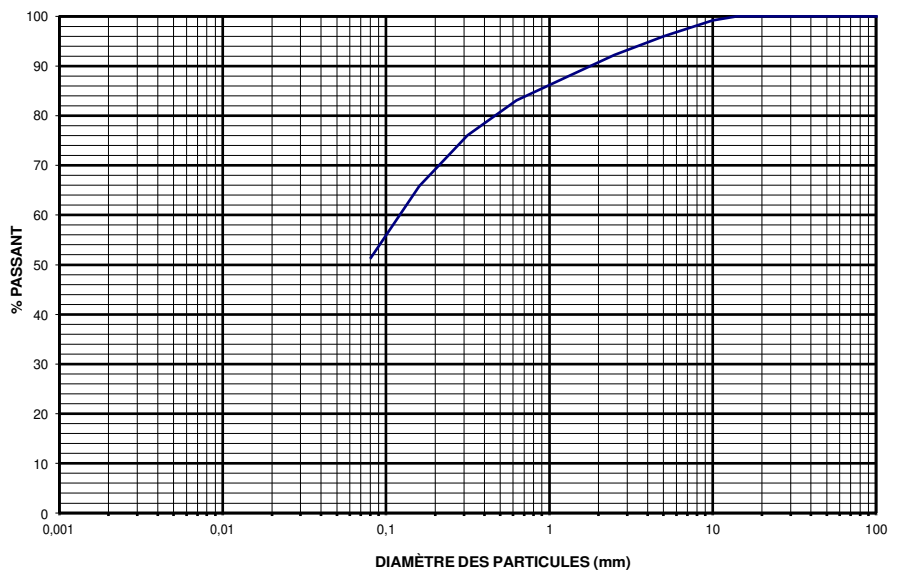
ANALYSE NO: 19-478-6

**DONNÉES GÉNÉRALES**

Description: Silt et sable avec traces de gravier	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-4 / CF-4	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	100	15		
14 mm	100	30		
10 mm	99	60		
5 mm	96	120		
2,5 mm	92	240		
1,25 mm	88	480		
630 µm	83	1440		
315 µm	76			
160 µm	66			
80 µm	51,2			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	51
Sable %	45
Gravier %	4

**REMARQUES**

Teneur en eau : 11,9 %



**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

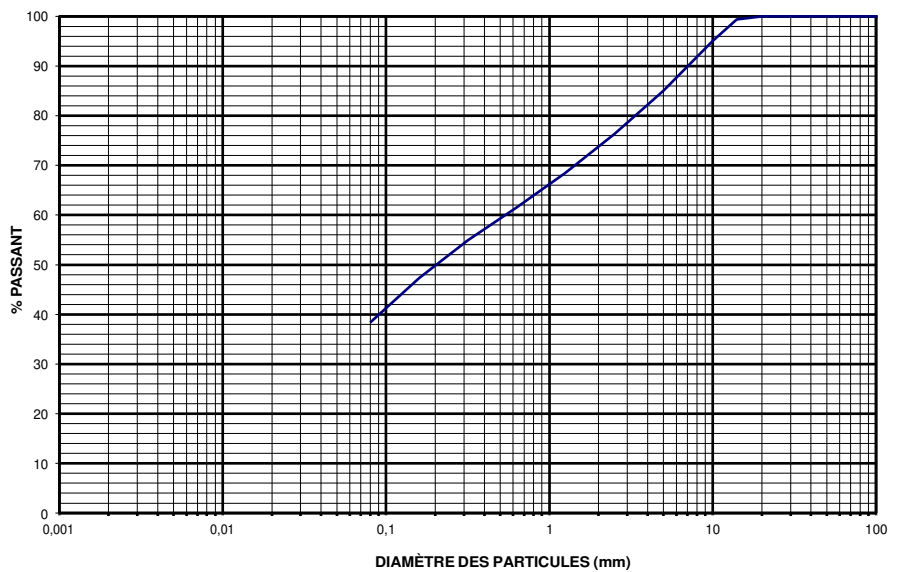
**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-7

**DONNÉES GÉNÉRALES**

Description: Sable et silt avec un peu de gravier	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-5 / CF-3	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	100	15		
14 mm	99	30		
10 mm	95	60		
5 mm	85	120		
2,5 mm	76	240		
1,25 mm	68	480		
630 µm	62	1440		
315 µm	55			
160 µm	47			
80 µm	38,4			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	38
Sable %	47
Gravier %	15

**REMARQUES**

Teneur en eau : 8,3 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-8

**DONNÉES GÉNÉRALES**

Description: Sable avec traces de silt	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-6 / CF-2A	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	100	15		
14 mm	100	30		
10 mm	100	60		
5 mm	100	120		
2,5 mm	100	240		
1,25 mm	100	480		
630 µm	99	1440		
315 µm	90			
160 µm	39			
80 µm	8,6			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	9
Sable %	91
Gravier %	0

**REMARQUES**

Teneur en eau : 11,6 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

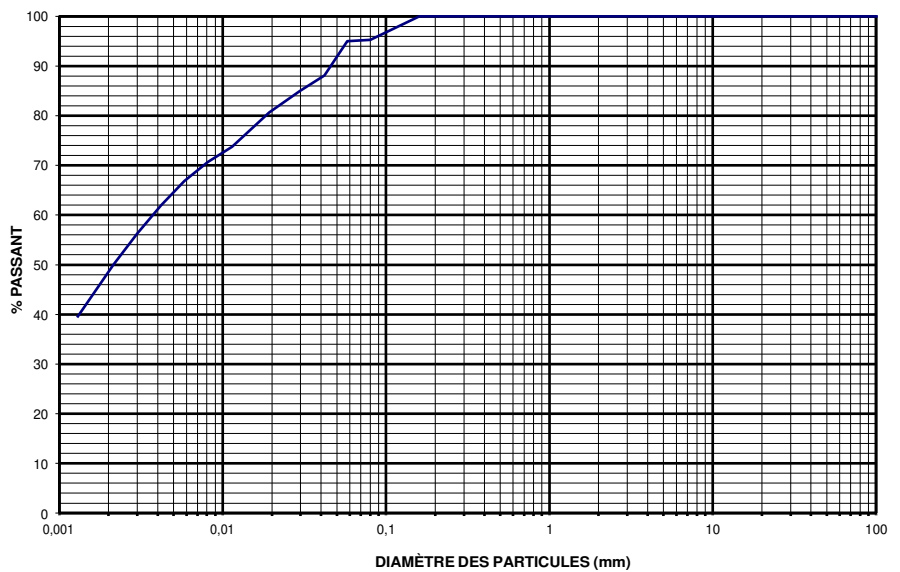
**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-9

**DONNÉES GÉNÉRALES**

Description: Argile et silt avec traces de sable	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-6 / CF-2B	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5	0,058	95,0
56 mm	100	1	0,042	88,1
40 mm	100	2	0,030	85,0
28 mm	100	5	0,019	80,6
20 mm	100	15	0,011	73,8
14 mm	100	30	0,008	70,6
10 mm	100	60	0,006	66,9
5 mm	100	120	0,004	61,9
2,5 mm	100	240	0,003	56,3
1,25 mm	100	480	0,002	50,0
630 µm	100	1440	0,001	39,4
315 µm	100			
160 µm	100			
80 µm	95,3			

**COURBE GRANULOMÉTRIQUE**



**RÉSUMÉ DES ESSAIS**

Argile %	48
Silt %	47
Sable %	5
Gravier %	0

**REMARQUES**

Teneur en eau : 29,5 %

**CLIENT:** 1199 NEWMARKET HOLDINGS INC.  
**PROJET:** 1195, Newmarket street, Ottawa

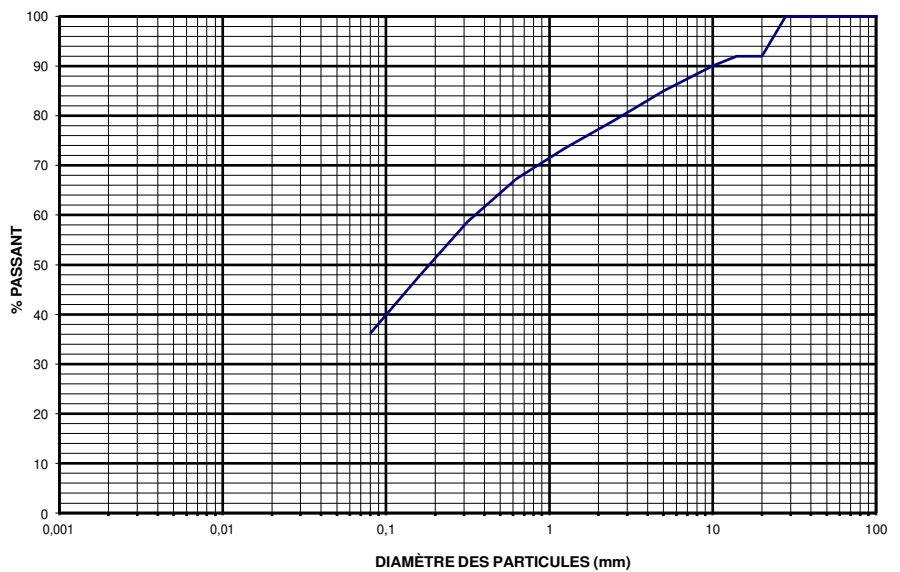
**DOSSIER:** 13340  
**ANALYSE NO:** 19-478-10

**DONNÉES GÉNÉRALES**

Description: Sable et silt avec un peu de gravier	Prélevé le: 2019-08-27	Par: D. H.
Provenance: F-7 / CF-3	Analysé le: 2019-09-11	Par: A. P.

ANALYSE GRANULOMÉTRIQUE		SÉDIMENTOMÉTRIE		
		TEMPS (MIN)	DIAMÈTRE (MM)	% PASSANT
112 mm	100			
80 mm	100	0,5		
56 mm	100	1		
40 mm	100	2		
28 mm	100	5		
20 mm	92	15		
14 mm	92	30		
10 mm	90	60		
5 mm	85	120		
2,5 mm	79	240		
1,25 mm	73	480		
630 µm	67	1440		

**COURBE GRANULOMÉTRIQUE**



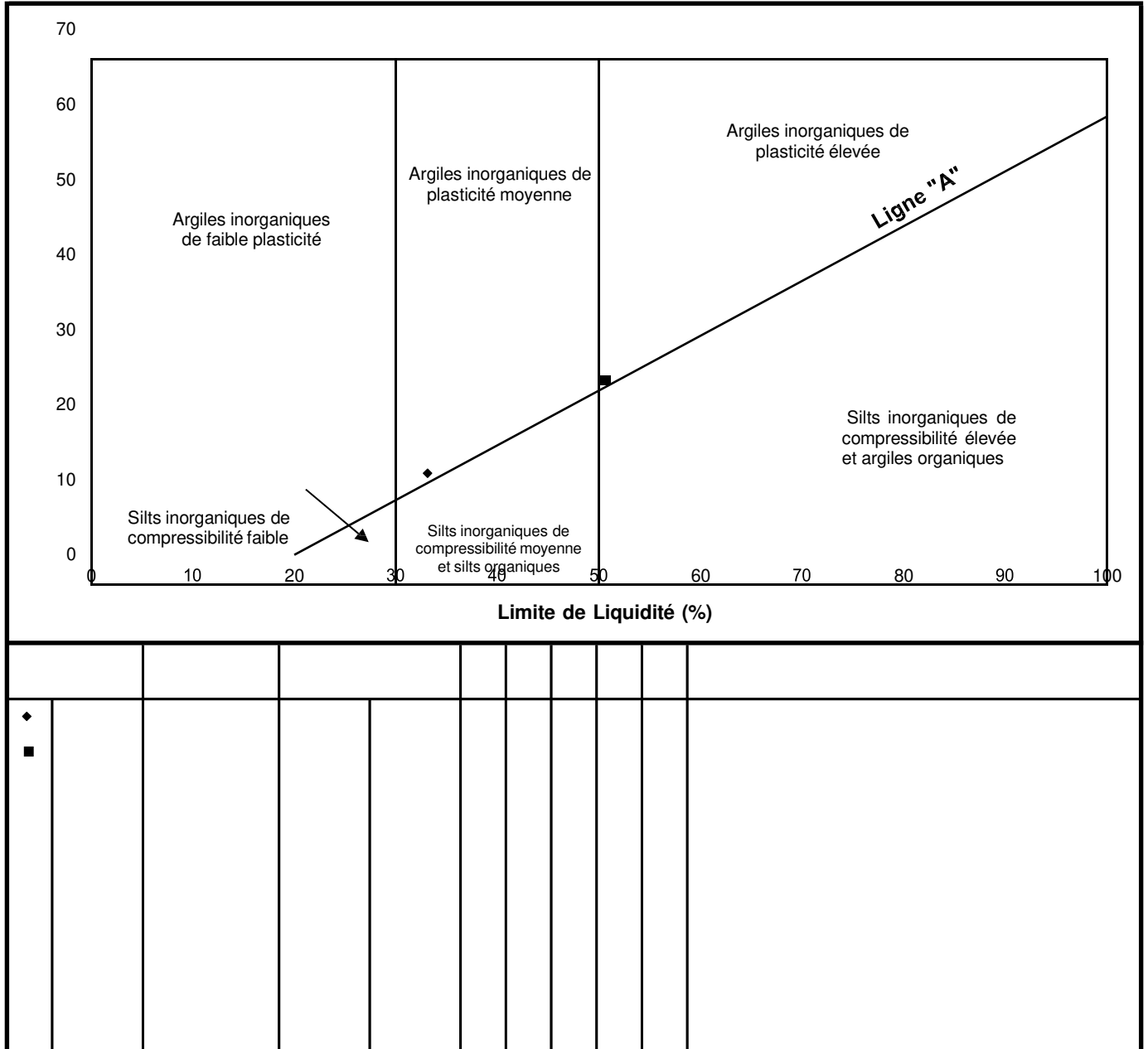
**RÉSUMÉ DES ESSAIS**

Argile %	0
Silt %	36
Sable %	49
Gravier %	15

**REMARQUES**


## ABAQUE DE PLASTICITÉ (Compilation des résultats)

CLIENT: 1199 NEWMARKET HOLDINGS INC.  
 PROJET: Warehouse Newmarket  
 SITE: 1195, Newmarket street, Ottawa  
 DOSSIER: 13340



## APPENDIX 4

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### ❖ Pavement Structural Design Requirements

# Pavement Structural Design Matrix – Minimum Requirements

## City of Toronto



		30,000		40,000		50,000		60,000		75,000	
		30 MPa	50 MPa	30 MPa	50 MPa	30 MPa	50 MPa	30 MPa	50 MPa	30 MPa	50 MPa
Major Arterial	Non-Truck Routes (5% Commercial Vehicles)	40 mm SP12.5 FC2 D 110 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 500 mm Total	40 mm SP12.5 FC2 D 90 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 480 mm Total	40 mm SP12.5 FC2 D 125 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 515 mm Total	40 mm SP12.5 FC2 D 100 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 490 mm Total	40 mm SP12.5 FC2 D 135 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 525 mm Total	40 mm SP12.5 FC2 D 110mm SP19.0 D 150 mm Granular A 200 mm Granular B* 500 mm Total	40 mm SP12.5 FC2 D 120 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 510 mm Total	40 mm SP12.5 FC2 D 145 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 535 mm Total	40 mm SP12.5 FC2 D 155mm SP19.0 D 150 mm Granular A 200 mm Granular B* 545 mm Total	40 mm SP12.5 FC2 D 125 mm SP19.0 D 150 mm Granular A 200 mm Granular B* 515 mm Total
	Truck Routes (7.5% Commercial Vehicles)	40 mm SP12.5 FC2 D 130 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 570 mm Total	40 mm SP12.5 FC2 D 110 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 550 mm Total	40 mm SP12.5 FC2 D 150 mm SP19.0 D 150 mm Granular A 250 mm Granular B 590 mm Total	40 mm SP12.5 FC2 D 130 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 570 mm Total	40 mm SP12.5 FC2 D 155 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 595 mm Total	40 mm SP12.5 FC2 D 135 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 575 mm Total	40 mm SP12.5 FC2 E 160 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 600 mm Total	40 mm SP12.5 FC2 E 145 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 585 mm Total	40 mm SP12.5 FC2 E 170 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 610 mm Total	40 mm SP12.5 FC2 E 150 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 590 mm Total
	Truck Routes (10% Commercial Vehicles)	40 mm SP12.5 FC2 D 150 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 590 mm Total	40 mm SP12.5 FC2 D 125 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 565 mm Total	40 mm SP12.5 FC2 D 160 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 600 mm Total	40 mm SP12.5 FC2 D 135 mm SP19.0 D 150 mm Granular A 250 mm Granular B* 575 mm Total	40 mm SP12.5 FC2 E 170 mm SP19.0 E 150 mm Granular A 250 mm Granular B 610 mm Total	40 mm SP12.5 FC2 E 145 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 585 mm Total	40 mm SP12.5 FC2 E 175 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 615 mm Total	40 mm SP12.5 FC2 E 155 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 595 mm Total	40 mm SP12.5 FC2 E 185 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 625 mm Total	40 mm SP12.5 FC2 E 165 mm SP19.0 E 150 mm Granular A 250 mm Granular B* 605 mm Total

		20,000		25,000	
		30 MPa	50 MPa	30 MPa	50 MPa
Minor Arterial	Non-Truck Routes (4% Commercial Vehicles)	40 mm SP12.5 FC1 C 95 mm SP19.0 D 150 mm granular A 150 mm Granular B* 435 mm Total	40 mm SP12.5 FC1 C 80 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 420 mm Total	40 mm SP12.5 FC1 C 105 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 445 mm Total	40 mm SP12.5 FC1 C 85 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 425 mm Total
	Truck Routes (7.5% Commercial Vehicles)	40 mm SP12.5 FC1 C 135 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 475 mm Total	40 mm SP12.5 FC1 C 110 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 450 mm Total	40 mm SP12.5 FC1 C 140 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 480 mm Total	40 mm SP12.5 FC1 C 120 mm SP19.0 D 150 mm Granular A 150 mm Granular B* 460 mm Total

		5,000		7,500		10,000		15,000	
		30 MPa	50 MPa	30 MPa	50 MPa	30 MPa	50 MPa	30 MPa	50 MPa
Collector	Comm./Ind. (5% Commercial Vehicles)			40 mm SP12.5 B 105 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 445 mm Total	40 mm SP12.5 B 75 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 415 mm Total	40 mm SP12.5 B 115 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 455 mm Total	40 mm SP12.5 B 85 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 425 mm Total	40 mm SP12.5 B 125 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 465 mm Total	40 mm SP12.5 B 95 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 435 mm Total
	Residential (3% Commercial Vehicles)	40 mm SP12.5 B 70 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 410 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total	40 mm SP12.5 B 85 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 425 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total	40 mm SP12.5 B 95 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 435 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total		

		All Traffic & Subgrade
Composite Pavements	Major Arterial	40 mm Surface layer** 50 mm Base layer** 250 mm PCC Concrete 150 mm Granular A 490 mm Total
	Minor Arterial - Bus/Truck Route	40 mm SP12.5 FC1 C 50 mm SP19.0 D 250 mm PCC Concrete 150 mm Granular A 490 mm Total
	Local Collector - Bus/Truck Route	50 mm SP12.5 B 200 mm PCC Concrete 150 mm Granular A 400 mm Total
	Local Collector - Non Bus/Truck Route	50 mm SP12.5 B 150 mm PCC Concrete 150 mm Granular A 350 mm Total

Notes:	AADT
	Subgrade

\* Subbase is Granular B - Type II as specified in TS 1010  
 \*\* Surface and base layer asphalt mixe types for Major Arterial composite pavements should be selected based on the AADT as prescribed for flexible pavements

		2,500		3,000		4,500	
		Local Residential (3% Commercial Vehicles)		Local Industrial (10% Commercial Vehicles)		Local Throughway (3% Commercial Vehicles)	
		30 MPa	50 MPa	30 MPa	50 MPa	30 MPa	50 MPa
Local		40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total	40 mm SP12.5 B 80 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 420 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total	40 mm SP12.5 B 60 mm SP19.0 B 150 mm Granular A 150 mm Granular B* 400 mm Total

Designers shall use the pavement structural design matrix as minimum layer thickness during pavement design and analysis. Layer thickness may need to be increased based on the higher traffic volume, higher truck percentage or in situ resilient modulus.

## APPENDIX 5

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- ❖ Certificate of analysis of soils tested for corrosive action



Client: Groupe Ortam  
1200, rue de Louvain O.  
Montreal, QC  
H4N 1G5  
Attention: Mr. Tony Novembre  
PO#:  
Invoice to: Groupe Ortam

Report Number: 1968657  
Date Submitted: 2021-12-14  
Date Reported:  
Project:  
COC #: 215800

Page 1 of 4

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**Dear Tony Novembre:**

**Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).**

Report Comments:

APPROVAL: \_\_\_\_\_

Sarah Horner, Inorganics Technician

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

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Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Client: Groupe Ortam  
 1200, rue de Louvain O.  
 Montreal, QC  
 H4N 1G5  
 Attention: Mr. Tony Novembre  
 PO#:  
 Invoice to: Groupe Ortam

Report Number: 1968657  
 Date Submitted: 2021-12-14  
 Date Reported:  
 Project:  
 COC #: 215800

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1601839 Soil 2021-12-13 1M Bottom	1601840 Soil 2021-12-13 1M Top	1601841 Soil 2021-12-13 2M Bottom	1601842 Soil 2021-12-13 2M Top
General Chemistry	Anions	0.002	%			<0.002	<0.002	0.006	0.002
		0.01	%			0.03	<0.01	0.01	0.02
	Electrical Conductivity	0.05	mS/cm			0.25	0.19	0.26	0.22
	pH	2.00				8.33	8.37	7.97	9.07
	Resistivity	1	ohm-cm			4170	5260	4000	4760
Sulphide-Soil	S2-					in-progress	in-progress	in-progress	in-progress
Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1601843 Soil 2021-12-13 3M Bottom	1601844 Soil 2021-12-13 3M Top	1601845 Soil 2021-12-13 4M Bottom	1601846 Soil 2021-12-13 4M Top
General Chemistry	Anions	0.002	%			N.R.	0.020	0.007	0.014
		0.01	%			0.01	0.01	0.01	<0.01
	Electrical Conductivity	0.05	mS/cm			0.31	0.63	0.34	0.37
	pH	2.00				8.40	7.45	8.38	8.33
	Resistivity	1	ohm-cm			3230	1610	3030	2780
Sulphide-Soil	S2-					in-progress	in-progress	in-progress	in-progress

**Guideline =** \* = **Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.  
 Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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Lab I.D. 1601847  
 Sample Matrix Soil  
 Sample Type  
 Sampling Date 2021-12-13  
 Sample I.D. 4.6M

Group	Analyte	MRL	Units	Guideline	
Anions	Cl	0.002	%		0.007
	SO4	0.01	%		<0.01
General Chemistry	Electrical Conductivity	0.05	mS/cm		0.26
	pH	2.00			8.44
	Resistivity	1	ohm-cm		4000
Sulphide-Soil	S2-				in-progress

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**Certificate of Analysis**

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**QC Summary**

Analyte	Blank	QC % Rec	QC Limits
<b>Run No</b> 414211 <b>Analysis/Extraction Date</b> 2021-12-16 <b>Analyst</b> MW <b>Method</b> Cond-Soil			
Electrical Conductivity	<0.05 mS/cm	99	90-110
pH	7.18	100	90-110
Resistivity			
<b>Run No</b> 414227 <b>Analysis/Extraction Date</b> 2021-12-16 <b>Analyst</b> MW <b>Method</b> C CSA A23.2-4B			
Chloride	<0.002 %		90-110
<b>Run No</b> 414230 <b>Analysis/Extraction Date</b> 2021-12-16 <b>Analyst</b> MW <b>Method</b> AG SOIL			
SO4	<0.01 %	100	70-130

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