

--- **PR5.2.1 Annexes P et Q**

Projet d'exploitation du gisement de
graphite naturel du Lac-Guéret dans la MRC
de Manicouagan

6211-08-017

Annexe P

Preliminary Geotechnical Investigation Report - Concentrator site – Plant (Qualitas, 2015)



Qualitas

GROUPE QUALITAS INC.
3306, boul. Saint-François
Jonquière (Québec)
Canada G7X 2W9
www.qualitas.qc.ca

Tél. : 418-547-5716
Télec. : 418-547-0374

MASON GRAPHITE INC.
3030 Le Carrefour blvd.
Suite 600
Laval, Quebec H7T 2P5

 **HATCH**

REFERENCE DOCUMENT

No: E347199-QUAL-15-124-0001_Sub001

Preliminary Geotechnical Investigation Report Concentrator site - Plant

**Baie-Comeau
Quebec, Canada**

Qualitas Project No. : 632622
Mandate No. : 632622.1
Hatch Reference No. : H347199

Distribution : Jean L'Heureux, Eng.
Executive Vice President, industrial process development,
Mason Graphite Inc. (PDF)

Emmanuelle Arié, Eng., M.A.Sc.
Senior geotechnical engineer, Hatch Ltée (PDF)

GROUPE QUALITAS INC.

December 17th, 2015

Martine Chabot, Jr. Eng.
Project assistant
OIQ member number : 5045706

Martin Dolbec, Eng.
Project manager
OIQ member number: 128835

Alexandre Aubin, Eng.
Geological engineer
OIQ member number: 144629

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(This report is composed of 234 pages including appendices and cannot be reproduced in part without the permission of Groupe Qualitas Inc.)

1.0 INTRODUCTION

1.1 MANDATE

Mason Graphite Inc. (Mason Graphite) acquired claim rights on a native graphite deposit located near Lac Gueret, about 80 km North-West from the Daniel Johnson Dam (Manic 5), in Quebec's North Shore region. In addition, the plant (concentrator and storage of processed graphite) and the Tailings Management Facility (TMF) will be located in the area of Baie-Comeau (Quebec) in Jean-Noël-Tessier industrial park.

Mason Graphite mandated Groupe Qualitas Inc. (Qualitas) to carry out two previous mandates related to the current project. The first mandate was a geotechnical and geomechanical investigation campaign to collect data on the Lac Gueret property (Report No.623409, dated April 1st, 2015). The second mandate was a geotechnical investigation campaign to collect data on one of the considered sites for the concentrator, in Jean-Noël-Tessier industrial park, in Baie-Comeau (Report No.626738, dated April 21st, 2015).

As part of this ongoing project, Mason Graphite mandated Qualitas for a third investigation which aimed to collect more geological and geotechnical data on the selected location of the future plant and TMF site.

The project follows the acceptance of our service proposal No. 15-02131, dated September 16th 2015 and the purchase order No. 2015-0917B issued by Mason Graphite on September 17th 2015. This mandate is divided into two sub-mandate performed concomitantly.

Mandate 1: no. 632622.1 - Preliminary geotechnical investigation of **plant area**;

Mandate 2: no. 632622.2 - Preliminary geotechnical investigation of **TMF area**.

This paper presents the work done for Mandate 1. Qualitas has therefore followed the work program described by Hatch in the technical document titled: *Summary of Work* (Document No. H347199-0000-15-123-0001, Rev. 0, dated August 28th, 2015). Throughout the field work, Qualitas worked in close collaboration with the client and his consultant (Hatch) to optimize the work program and to be able to rapidly adjust the work program depending on the collected field data. Adjustments to the work program have also been made in the course of the investigation at the client and his consultant's request (refer to section 1.3 for details).

1.2 SITE DESCRIPTION

Mason Graphite's projected plant and TMF site is to be located a few kilometres North of Baie-Comeau in Jean-Noël-Tessier industrial park. The field work area is located at some distance to the South-West of Petit-Bras Lake and is accessible via road 138 and by the Petit-Bras lake road. The plant area is located in the South part of the site whereas the TMF area is located in the North. The following Figure 1 shows the approximate location of the proposed concentrator site. For further details on the location of the projected plant area, refer to drawing 632622.1-01, in Appendix 3.



Figure 1 - Approximate location of the concentrator site (plant + TMF)¹

¹ Google Map, online 2015-12-07

1.3 PROJECT SUMMARY

Prior to the field work, an authorization certificate was issued by the *Société d'expansion de Baie-Comeau* (certificate no. 16-3B-2015, delivered on November 1st), allowing Qualitas to realize the geotechnical investigation.

The fieldwork for the plant and TMF area (realized concomitantly) has been carried out from September 21st to October 17th, 2015. The **plant area** fieldwork includes :

- Field visit;
- Wood clearing work;
- Geological mapping;
- Diamond drilling of 8 boreholes (including a complement, BH-15-03B);
- 37 test pits;
- Soil and rock sampling;
- 4 monitoring well installations;
- 1 Casagrande piezometer installation;
- Surveying of test locations;
- General petrographic and geomechanical core descriptions;
- Selection of rock core samples for laboratory tests;
- Selection of soil samples for laboratory tests.

Test pit TP-15-39 and borehole BH-15-14 were added to the original scope of work at Hatch request and the client's approval.

Back in the office, core logging and laboratory testing on soil and rock were performed. Also, some environmental soil samples were collected in some of the test pits as planned in the original scope of work but no chemical analyses were carried out. Therefore, only geotechnical testing was carried out on soil samples at the request of Hatch.

This report presents the work details and method, the geological and geotechnical characteristics of soils and rock and the groundwater conditions encountered at the projected plant site.

2.0 WORK DETAILS AND METHODS

2.1 FIELD VISIT

A field visit was carried out prior to the geotechnical investigation to position every test location. The visit was realized on the 9th and 10th of September by Mr. Normand Tremblay (field supervisor) and Mr. Harley-David Malouin (technical assistant), both from Qualitas.

Furthermore, this visit aimed to prepare path clearing by determining favorable access trails to the test locations. Our field supervisor chose the different trails while taking into account the terrain topography and the trees density to reduce wood clearing time and cost.

2.2 WOOD CLEARING WORK

The wood clearing work was carried out by *Les Entreprises Forestières J.P. Deschênes* (RCI's subcontractor) under the constant supervision of Mr. Hugues Potvin, of Qualitas.

5-metres-wide trails were cleared for the machinery. Along the paths trees more than 10 cm (4 inches) in diameter were cut and neatly piled on the trailside. Some logs were reused to build bridges across boggy areas.

The following figures show general view of the land-clearing work.



Figure 2 - General view of the wood-clearing work



Figure 3 - Tree trunks placed across the path, on soft terrain

2.3 BOREHOLE DRILLING

Prior to drilling, the sites were leveled using a Komatsu PC138 hydraulic excavator used for the test pits and provided by a local contractor.

All the boreholes were drilled using a CME-55 drill, mounted on a CME-300 tracked carrier (Figure 4) using the cased wash boring method. The drilling and other equipments mentioned above were owned and operated by Forage André Roy Inc., subcontracted by Qualitas. A total of 8 boreholes were drilled under mandate 632622.1 in the plant area. The drilling length of the 8 boreholes ranged from 9.28 to 25.92 m. The boreholes were drilled under the constant supervision of our geotechnical field supervisors, either Mr. Kevin Simoneau or Mr. Alex Tremblay. Borehole locations are shown on drawing 632622.1-01 in Appendix 3.



Figure 4 - CME-55 drill in operation

The material and the core boxes were transported with a track-mounted ATV and drilling water was supplied by streams or swamps located near the drilling sites.

The boreholes were drilled to provide geotechnical information on the overburden and surface bedrock. A NW-size casing shoe was used to drill the surface deposit. Soil

samples were collected using a 60-mm-long split-spoon driven by a 63.5 kg hammer, in accordance with the ASTM D1586 standard except in borehole BH-15-03B whose purpose was only to reach the bedrock and sample it. Standard Penetration Test (SPT) “N” values were recorded at the same time the soils were sampled with the split-spoon. Once the casing reached the bedrock, the borehole was continued using a NQ-size core sampler (core diameter: 47.6 mm). All boreholes were stopped once the field team reached the ending criterias (coring 6 m in solid rock, corresponding to a TCR of 90 % and a RQD of more than 75 % and reaching elevation 60 m).

In all boreholes, except in BH-15-03B and BH-15-04, in situ undrained shear strength measurements (s_u) were taken at every metre in the clay deposit while remoulded shear strength measurements were taking every 2 metres. The s_u and s_r measurements were realized using a Nilcon field vane Nilcon according to standard ASTM D2573. The results are integrated in the borehole logs, presented in Appendix 1.

A dynamic cone penetrometer test (DCPT) was realized next to borehole BH-15-03 from 11.43 to 20.04 m where a refusal on the assumed bedrock was encountered. The DCPT is a continuous test which utilizes a dropping weight to drive a cone and rod into the ground to evaluate the depth of refusal. The number of blows for each 300-mm penetration is recorded and corresponds to the penetration rating (N_{dc}) that indicates the condition of compactness of the soils. DCPT is not a standardized test therefore, N_{dc} values are different than standard “N” values and cannot be interpreted the same way. However, a commonly used rule of thumb says that in clean sands, the N_{dc} index is approximately equal to 1.5 times the SPT N value. Otherwise, N_{dc} values can always be used to give a qualitative evaluation of soil density. The results are integrated in borehole log BH-15-03, presented in Appendix 1.

Rock core samples were examined on site and RQD (*Rock Quality Designation*) and TCR (*Total Core Recovery*) values were measured for every core run. The borehole logs can be consulted in Appendix 1. The following table shows the location of the boreholes, depths reached, and corresponding survey elevations.

The rock core samples were all brought back in core boxes to Qualitas office for further laboratory testing. As mentioned previously, soil samples were also brought back for this purpose.

Table 1 Borehole locations and depths						
Borehole No.	Coordinates UTM 19 NAD 83		Date	Elevation of surface (m)	Elevation of bedrock (m)	Total depth (m)
	Eastern	Northing				
BH-15-03	555256.36	5452470.03	2015-10-03	67.69	47.65 ⁽¹⁾	11.43 ⁽²⁾
BH-15-03B	555257.67	5452466.97	2015-10-14	67.68	48.53	25.92
BH-15-04	555384.60	5452356.55	2015-09-30	69.75	68.75	10.73
BH-15-05	555426.42	5452322.01	2015-09-29 to 2015-09-30	69.81	63.71	13.69
BH-15-06	555383.96	5452436.45	2015-10-02	68.54	64.80	11.83
BH-15-07	555431.20	5452433.70	2015-10-01	68.79	66.71	9.28
BH-15-08	555512.65	5452494.05	2015-10-04 to 2015-10-05	72.08	67.11	13.24
BH-15-14	555514.11	5452309.41	2015-10-05 to 2015-10-06	70.09	56.00	16.61

Notes :
1 Depth of assumed bedrock (DCPT);
2 End of sampling and beginning of DCPT. End of DCPT at 20.04 metres of depth.

2.4 TEST PIT

A total of 37 test pits were excavated with a Komatsu PC138 hydraulic excavator on the plant area. The test pits aimed to check the stratigraphy and to confirm the depth and the dip of the bedrock. The test pits were carried out under the supervision of Mr. Simoneau or Mr. Tremblay, of Qualitas and dug at depths between 0.15 and 5.50 metres. Samples were collected inside the test pits for laboratory examination and further laboratory testing. The following table shows the location of the test pits, depths reached, and corresponding surveyed elevations.

Table 2
Test pit locations and depths

Test pit No.	Coordinates UTM 19 NAD 83		Date	Elevation of surface (m)	Elevation of bedrock at survey location (m)	Total depth (m)
	Eastern	Northing				
TP-15-01	555466.45	5452544.45	2015-10-05	74.19	72.99 ⁽⁵⁾	1.20
TP-15-02	555372.04	5452479.87	2015-09-30	71.09	70.94 ⁽⁴⁾	0.15
TP-15-03	555335.49	5452439.00	2015-09-30	67.97	64.87	3.10
TP-15-04	555318.54	5452421.37	2015-09-30	68.81	66.51	2.30
TP-15-05	555404.60	5452411.41	2015-09-30	69.82	66.22 ⁽⁴⁾	3.60
TP-15-06	555438.48	5452405.86	2015-09-29	69.62	67.87 ⁽⁴⁾	1.75
TP-15-07	555478.31	5452386.64	2015-09-29	70.22	69.97	0.25
TP-15-08	555501.82	5452401.28	2015-09-29	69.27	66.27	3.00
TP-15-09	555483.39	5452475.93	2015-10-05	73.59	73.29 ⁽⁵⁾	0.30
TP-15-10	555410.53	5452378.35	2015-09-29	71.43	71.18	0.25
TP-15-11	555538.78	5452357.01	2015-10-01	69.71	65.71	4.00
TP-15-12	555498.08	5452523.59	2015-10-05	74.34	74.04 ⁽⁵⁾	0.30
TP-15-13	555522.59	5452463.38	2015-10-05	72.99	72.79	0.20
TP-15-14	555546.36	5452501.63	2015-10-07	71.87	71.47 ⁽⁴⁾	0.40
TP-15-15	555079.85	5452385.12	2015-10-01	69.23	66.93	2.30
TP-15-16	555347.27	5452314.81	2015-09-28	68.82	66.12 ⁽⁵⁾	2.70
TP-15-17	555209.06	5452340.97	2015-10-07	70.00	66.70 ⁽⁵⁾	3.30
TP-15-18	555310.92	5452352.03	2015-10-07	69.65	67.35 ⁽⁵⁾	2.30
TP-15-19	555395.77	5452316.90	2015-09-28	69.73	67.23 ⁽⁵⁾	2.50
TP-15-20	555456.50	5452308.33	2015-09-28	69.98	66.98 ⁽¹⁾	3.00
TP-15-21	555125.43	5452480.80	2015-10-01	66.90	64.10	2.80
TP-15-22	555050.97	5452467.19	2015-10-01	66.34	64.24	2.10
TP-15-23	555246.67	5452378.08	2015-10-07	68.58	64.88 ⁽⁵⁾	3.70
TP-15-24	555420.68	5452448.07	2015-09-30	70.03	69.88	0.15
TP-15-25	555451.77	5452426.39	2015-09-30	68.92	66.92	2.00
TP-15-26	555403.63	5452516.10	2015-10-06	68.67	65.17	3.50
TP-15-27	555419.52	5452499.92	2015-10-06	69.11	66.31	2.80
TP-15-28	555428.28	5452523.74	2015-10-06	70.12	68.62 ⁽⁴⁾	1.50
TP-15-29	555401.52	5452550.41	2015-10-06	69.30	67.50	1.80

Table 2 Test pit locations and depths						
Test pit No.	Coordinates UTM 19 NAD 83		Date	Elevation of surface (m)	Elevation of bedrock at survey location (m)	Total depth (m)
	Eastern	Northing				
TP-15-30	555302.60	5452533.40	2015-10-06	67.85	< 63.45 ⁽²⁾	4.40
TP-15-31	555509.26	5452300.81	2015-09-28	70.13	< 68.23 ⁽³⁾	1.90
TP-15-32	555425.67	5452350.63	2015-09-28	70.07	68.57	1.50
TP-15-33	555475.37	5452443.91	2015-10-05	70.36	70.16 ⁽⁵⁾	0.20
TP-15-34	555453.59	5452513.87	2015-10-06	70.48	69.18 ⁽⁴⁾	1.30
TP-15-35	555347.68	5452530.46	2015-10-06	67.96	< 63.56 ⁽²⁾	4.40
TP-15-36	555212.79	5452484.08	2015-10-01	67.43	< 61.93 ⁽²⁾	5.50
TP-15-39	555345.96	5452383.06	2015-10-07	70.49	70.24	0.25

Notes :

- 1 Refusal on assumed bedrock or large blocks.
- 2 Reached the limit of the equipment. Bedrock not reached.
- 3 Limit of the test pit due to water infiltrations from the bottom.
- 4 Step-like bedrock dip. See drawing in Appendix 1 for further details.
- 5 Irregular bedrock surface. The depth of the encountered bedrock is not planar. See drawing in Appendix 1 for further details.

The test pit logs are presented in Appendix 1, following the borehole logs.

2.5 GEOLOGICAL MAPPING

Geological mapping was realized within the whole area of the projected plant by Mr. Potvin and Mr. Simoneau. The geological mapping included the following items:

- Description of the physical environment;
- Important landscape features such as outcrops and streams;
- Note of erratic elements, such as boulders;
- Description of peat bogs;
- Note of erosion, risk of instability, or rock falls.

A companion photographic report is presented in Appendix 4 to be consulted alongside the geological map (drawing 632622.1-02).

2.6 BOREHOLE INSTRUMENTATION

Five out of eight boreholes were instrumented to monitor groundwater level variation with monitoring wells in boreholes BH-15-03, BH-15-04, BH-15-05, BH-15-08 and with a Casagrande piezometer in borehole BH-15-07.

The monitoring wells were built using PVC casings (schedule 40) of 38 mm in outside diameter, fitted with a 3.0 to 8.0 m long slotted screen section at the bottom. The slotted screen PVC section rested either directly at the bottom of the borehole or on silica sand to elevate the monitoring well installation. The annular space between the borehole wall and the PVC casing was filled with silica sand, including the slotted screen section. In boreholes BH-15-04 and BH-15-05 the monitoring wells was first sealed at the rock/overburden contact and then at the overburden/surface contact. Monitoring wells BH-15-03 and BH-15-08 were sealed with one bentonite plug at the overburden/surface contact to isolate the monitoring well from any surface water infiltrations.

The Casagrande piezometer was built using a porous cell of 0.3 m fitted with a 19 mm PVC casing. The annular space between the borehole wall and the porous cell was also filled with silica sand. The piezometer was first sealed with a bentonite plug at the rock/overburden contact and a second one at the top of the porous cell.

A protective steel casing fitted with a lockable aluminum lid was installed to cover and protect the entire above-ground PVC section of the monitoring wells and the Casagrande piezometer.

The monitoring wells installation details are presented in Appendix 1, in the corresponding borehole logs. Groundwater depths are presented in section 3.2 of this report.

2.7 GEODETIC SURVEY

Every test location was positioned on the field during the initial visit by our field supervisor using a Trimble GPS model GEO 7 using the Global Navigation Satellite System (GNSS) technology, with a precision of ± 0.050 metres in X and Y coordinates and 0.075 metres in Z coordinate (geodesic elevation). The benchmark used as a reference to survey the elevation of the test location was provided by a project carried in 2013 by the ministère des Transports du Québec: *Amélioration de la route 389 du*

ministère des Transports du Québec. The specifications of the benchmark are provided in Appendix 5.

The test coordinates were those specified by Hatch for the plant area on the drawing titled: *Preliminary geotechnical Investigation – ACP3009 Plant* (Document No H347199-0000-15-042-0004, Rev. 0, dated August 27th, 2015). After the field work was completed, the sounding locations were surveyed by RCI's surveyors using a Trimble GPS model R8 using the GNSS technology (precision of ± 0.008 metres in X and Y coordinates and 0.015 metres in Z coordinate). The coordinates shown in Tables 1 and 2 refers to the UTM NAD 83 (Zone 19) coordinates system.

2.8 PETROGRAPHIC AND GEOMECHANICAL DESCRIPTION

A geological (petrographic) and geomechanical description of the rock cores was performed by Mr. Alexandre Aubin, geological engineer of Qualitas. The detailed geological description of the cores can be found in the borehole logs in Appendix 1. In addition to this description, the TCR (*Total Core Recovery*) and RQD (*Rock Quality Designation*) were measured for every drilling runs.

The complete geomechanical description tables are shown in Appendix 1, following the core pictures (dry and wet) of the drilled rock in each borehole.

2.9 LABORATORY TESTING

Soil and rock core samples were collected by the field inspector in the geotechnical boreholes and the test pits carried in the course of this mandate.

At the end of the field work, all the collected soil and rock core samples were brought back to Qualitas' laboratories in Jonquiere and Baie-Comeau, to be described and classified.

Laboratory tests were performed on selected soil and rock core samples to determine their geotechnical and geomechanical properties, respectively. The soil and rock laboratory testing program was decided in conjunction with Hatch.

The laboratory testing program for soil and rock core samples is presented in Table 3.

**Table 3
Soil and rock core laboratory testing**

Soil sample test	Corresponding standard	Quantity
Moisture Content	BNQ 2501-170	46
Grain Size Distribution (Sieve Method)	LC 21-040	16
Grain Size Distribution (Hydrometer Method)	BNQ 2501-025	5
Atterberg Limits	BNQ 2501-092	22
Thin-walled tube extraction, visual description and storage	ASTM D 2488	3
Oedometric Consolidation	ASTM D 2435	3
Permeability determination in an oedometric cell	LC 22-320	2
Sensitivity (fall-cone penetrometer method)	BNQ 2501-110	3
Relative density	--	3
Unit Weight	--	2
Rock core test	Corresponding standard	Quantity
Unit Weight	--	6
Uniaxial Compressive Strength	ASTM D 7012	6
Indirect Tensile Strength (Brazilian Test)	ASTM D 6921	3

The soil tests were conducted either at Qualitas laboratory in Jonquiere or in Baie-Comeau while all of the rock core tests were conducted in Jonquiere. Results of all tests are shown in the logs in Appendix 1 and in Figures 2.1 to 2.18 in Appendix 2.

Note that samples that were not used for the laboratory tests will be stored for a period of one year after this report is published. Once this one year period has elapsed, the samples will be destroyed unless directed otherwise by the client or his consultant.

3.0 RESULTS

3.1 STRATIGRAPHY AND LITHOLOGY

Stratigraphy and lithology interpretation and the soil and rock properties are based on drilling and test pits results and on laboratory tests carried out in this mandate. Subsequent sections describe the stratigraphic layers or lithologies encountered in the boreholes and trenches in order of increasing depth. Subsurface conditions encountered at specific locations are shown on the logs enclosed in Appendix 1 and are discussed below. A stratigraphic summary of the soils encountered in the plant area is presented in the following Table 4.

Table 4 Stratigraphic summary of the sounding in the plant area (depth in metres)										
Sounding no.	Organics	Peat layer	Sand	Silty sand	Silty clay	Silty sand	Silty sand	Gravelly sand	Rock or refusal at survey location	End of sounding
BH-15-03	--	0-0.99	--	0.99-2.14	2.14-20.04 ⁽¹⁾	--	--	--	20.04	20.04
BH-15-03B	--	0-0.99	--	0.99-2.14	2.14-19.15 ⁽¹⁻²⁾	--	--	--	19.15	19.15
BH-15-04	0-0.11	--	--	0.11-1.00	--	--	--	--	1.00	10.73
BH-15-05	0-0.23	--	--	--	0.23-4.27 ⁽¹⁾	4.27-6.10	--	--	6.10	13.69
BH-15-06	--	--	--	0-0.61 ⁽³⁾	0.61-3.05 ⁽¹⁾	3.05-3.35	3.35-3.74	3.74	3.74	11.83
BH-15-07	0-0.61	--	--	0.61-0.91	0.91-1.83	1.83-2.08	--	2.08	2.08	9.28
BH-15-08	0-0.35	--	--	--	0.35-2.44 ⁽¹⁾	--	2.44-3.05 ⁽¹⁾	4.97	4.97	13.24
	--	--	--	--	3.05-4.97	--	--	--	--	--
BH-15-14	--	--	--	0-1.83 ⁽¹⁻³⁾	1.83-12.09 ⁽¹⁾	12.09-13.72	13.72-14.09	14.09	14.09	16.61
TP-15-01	0-0.20	--	--	0.20-1.20	--	--	--	1.20 ⁽⁵⁾	1.20 ⁽⁵⁾	1.20
TP-15-02	0-0.15	--	--	--	--	--	--	0.15 ⁽⁵⁾	0.15 ⁽⁵⁾	0.15
TP-15-03	0-0.25	--	0.25-0.50	0.50-1.30	1.30-3.10	--	--	3.10	3.10	3.10
TP-15-04	0-0.30	--	0.30-1.80	--	1.80-2.30	--	--	2.30	2.30	2.30
TP-15-05	0-0.30	--	--	0.30-1.60 ⁽³⁾	1.60-3.60	--	--	3.60 ⁽⁵⁾	3.60 ⁽⁵⁾	3.60
TP-15-06	--	--	0-0.50 ⁽³⁾	--	0.50-1.75 ⁽³⁾	--	--	1.75 ⁽⁵⁾	1.75 ⁽⁵⁾	1.75
TP-15-07	--	0-0.25	--	--	--	--	--	0.25	0.25	0.25
TP-15-08	--	0-0.50	--	0.50-2.50 ⁽¹⁾	2.50-3.00 ⁽¹⁾	--	--	3.00	3.00	3.00
TP-15-09	0-0.30	--	--	--	--	--	--	0.30 ⁽⁵⁾	0.30 ⁽⁵⁾	0.30
TP-15-10	0-0.25	--	--	--	--	--	--	0.25	0.25	0.25
TP-15-11	--	0-1.00	1.00-1.25 ⁽¹⁾	--	1.25-4.00 ⁽¹⁾	--	--	4.00	4.00	4.00

Table 4 Stratigraphic summary of the sounding in the plant area (depth in metres)										
Sounding no.	Organics	Peat layer	Sand	Silty sand	Silty clay	Silty sand	Gravelly sand	Rock or refusal at survey location	End of sounding	
TP-15-12	0-0.30	--	--	--	--	--	--	0.30	0.30	
TP-15-13	0-0.20	--	--	--	--	--	--	0.20	0.20	
TP-15-14	0-0.40	--	--	--	--	--	--	0.40 ⁽⁵⁾	0.40	
TP-15-15	--	0-0.10	0.10-0.80 ⁽⁴⁾	0.80-2.20	2.20-2.30	--	--	2.30	2.30	
TP-15-16	0-0.20	--	--	--	0.20-2.70	--	--	2.70 ⁽⁵⁾	2.70	
TP-15-17	0-0.30	--	0.30-1.30	1.30-3.30	--	--	--	3.30 ⁽⁵⁾	3.30	
TP-15-18	0-0.30	--	0.30-1.30	--	1.30-2.25 ⁽¹⁾	--	--	2.30 ⁽⁵⁾	2.30	
	--	--	2.25-2.30 ⁽⁵⁾	--	--	--	--			
TP-15-19	0-0.20	--	0.20-1.20	1.20-1.50	1.50-2.50 ⁽¹⁾	--	--	2.50 ⁽⁵⁾	2.50	
TP-15-20	0-0.50	--	0.50-1.50	--	1.50-3.00 ⁽¹⁾	--	--	3.00	3.00	
TP-15-21	0-0.30	--	--	0.30-1.30	1.30-2.80 ⁽¹⁾	--	--	2.80	2.80	
TP-15-22	--	--	0-0.30 ⁽³⁾	0.30-2.10 ⁽¹⁾	--	--	--	2.10	2.10	
TP-15-23	0-0.30	--	0.30-0.80	--	0.80-3.70 ⁽¹⁾	--	--	3.70 ⁽⁵⁾	3.70	
TP-15-24	0-0.15	--	--	--	--	--	--	0.15	0.15	
TP-15-25	--	0-0.50	--	0.50-1 ⁽¹⁾	1.00-2.00 ⁽¹⁾	--	--	2.00	2.00	
TP-15-26	0-0.30	--	--	0.30-1.80 ⁽¹⁾	1.80-3.50 ⁽¹⁾	--	--	3.50	3.50	
TP-15-27	0-0.30	--	--	0.30-1.30	1.30-2.80 ⁽¹⁾	--	--	2.80	2.80	
TP-15-28	0-0.30	--	0.30-0.80	0.80-1.50	--	--	--	1.50 ⁽⁵⁾	1.50	
TP-15-29	0-0.40	--	0.40-1.80	--	--	--	--	1.80	1.80	
TP-15-30	0-0.90	--	--	--	0.90-2.40 ⁽¹⁾	2.40-4.40 ⁽¹⁾	--	--	4.40	

Table 4 Stratigraphic summary of the sounding in the plant area (depth in metres)										
Sounding no.	Organics	Peat layer	Sand	Silty sand	Silty clay	Silty sand	Gravelly sand	Rock or refusal at survey location	End of sounding	
TP-15-31	0-0.40	--	0.40-0.90 0.90-1.40 ⁽¹⁾	--	1.40-1.90 ⁽¹⁾	--	--	1.90	1.90	
TP-15-32	0-0.20	--	--	0.20-1.50	--	--	--	1.50	1.50	
TP-15-33	0-0.20	--	--	--	--	--	--	0.20 ⁽⁶⁾	0.20	
TP-15-34	0-0.30	--	--	0.30-1.30	--	--	--	1.30 ⁽⁶⁾	1.30	
TP-15-35	0-0.90	--	--	0.90-2.90 ⁽¹⁾	2.90-4.40	--	--	--	4.40	
TP-15-36	--	0-0.30	0.30-0.80	0.80-1.20	1.20-5.50 ⁽¹⁾	--	--	--	5.50	
TP-15-39	0-0.25	--	--	--	--	--	--	0.25	0.25	

Notes :

- 1 Presence of seashells in a part or entire deposit. Refer to the sounding logs in Appendix 1.
- 2 Bioturbation in the form of a 6 mm large hole (or tube), oriented horizontally at 3.48 m.
- 3 Presence of organics in a part or in the entire deposit. Refer to the sounding logs in Appendix 1.
- 4 Indurated sand from 0.40 to 0.80 m.
- 5 Assumed thin layer of sand overlying the bedrock.
- 6 Irregular bedrock surface, the depth of the encountered bedrock is not planar. See drawing in Appendix 1 for further details.

3.1.1 Overburden

In the following sections, the soil description has been interpreted and simplified to major strata for the purpose of geotechnical analysis.

The overburden was sampled in the 8 boreholes (BH-15-03 to BH-15-14) and 37 test pits (TP-15-01 to TP-15-36 and TP-15-39).

3.1.1.1 Surficial layer

An organic layer was encountered in all of the soundings except BH-15-03, BH-15-03B, BH-15-06, BH-15-14, TP-15-06, TP-15-07, TP-15-08, TP-15-11, TP-15-15, TP-15-22, TP-15-25 and TP-15-36. The surficial layer of dark brown organics is approximately 0.11 to 0.90 m thick. The organic layer is composed of moss, roots, wood debris and other organics at various stages of decomposition. Cobbles and boulders (maximum diameter of 0.70 m) were observed in TP-15-09 and TP-15-25 in volumetric proportions of 2-5 % and 3 %, respectively.

A layer of peat was encountered in boreholes BH-15-03, BH-15-03B and in test pits TP-15-07, TP-15-08, TP-15-11, TP-15-15, TP-15-25 and TP-15-36. The peat layer is approximately 0.10 to 1.00 m thick, has a dark brown color and is generally classified H1 (no decomposition) to H4 (some decomposition) according to the Von Post classification system

3.1.1.2 Sand some silt deposit

Under the organic layer or the peat layer in test pits TP-15-03, TP-15-04, TP-15-06, TP-15-11, TP-15-15, TP-15-17 to TP-15-20, TP-15-22, TP-15-23, TP-15-28, TP-15-29, TP-15-31 and TP-15-36 at the depths specified in Table 4, lies a 0.25 to 1.40-m-thick sand deposit with some silt, traces of gravel and traces of clay. Cobbles and boulders (maximum diameter of 0.40 m) were observed in TP-15-17, TP-15-28, TP-15-32 in volumetric proportions of 1-3 % and 1 %, respectively. The presence of seashells was noted in the sand deposit next to TP-15-11 and a 0.40-m-thick layer of indurated sand was also encountered next to TP-15-15.

Four grain size analyses were realized on that material and yielded the following results (see grain size distribution curve in Figure 2.1 of Appendix 2):

- Fines particles (< 0.08mm) : 13 to 21 % whereas the content of silt and clay was measured 1 time at 10 % and 11 %, respectively.

- Sand content : 80 to 83 %
- Gravel content : 1 to 4 %

Based on visual observation, the compactness of this deposit is deemed loose.

3.1.1.3 Silty sand deposit

Under the sand deposit or directly under the organics layer in BH-15-03 to BH-15-04, BH-15-06, BH-15-07, BH-15-14, TP-15-01, TP-15-03, TP-15-05, TP-15-08, TP-15-15, TP-15-17, TP-15-19, TP-15-21, TP-15-22, TP-15-25 to TP-15-28, TP-15-32 and TP-15-34 to TP-15-36 at the depths specified in Table 4, lies a 0.30 to 2.00 m-thick deposit composed of silty sand with some to traces of gravel and some to traces of clay. The presence of seashells was noted in part of or in the entire silty sand deposit in BH-15-14, TP-15-05, TP-15-08, TP-15-22, TP-15-25, TP-15-26, TP-15-31, TP-15-35. The presence of organics was also noted in that deposit in boreholes BH-15-06, BH-15-14 and test pit TP-15-05. Refer to the sounding logs of Appendix 1 for further details.

Ten grain size analyses were realized on that material and yielded the following results (see grain size distribution curves in Figure 2.2 of Appendix 2):

- Fines particles (< 0.08mm): 21 to 51 % whereas the content of silt and clay was measured 4 times and varied from 21 to 29 % and from 9 to 15 %, respectively.
- Sand content : 46 to 72 %
- Gravel content : 0 to 5 %

The presence of small pieces of seashells in the deposit may have overestimated the percentage of sand and gravel present in the samples.

Some silty sand samples collected during the field work were submitted to geotechnical laboratory testing. The Atterberg limits were determined for 2 samples representative of this deposit. The test results are presented in the logs of Appendix 1, in Figures 2.3 and 2.6 of Appendix 2 and in the following Table 5.

Table 5
Characteristics on the silty sand deposit

Sounding No.	Sample No.	Depth(m)		Water content w (%)	Sensitivity $S_t (S_{us}/S_{ur})$	Atterberg limits				ASTM D 2487 Classification
		From	To			Plastic limit w_p (%)	Liquid limit w_L (%)	Plasticity index I_p (%)	Liquidity index I_L (%)	
TP-15-17	MA-7	2.80	3.30	21	--	15	22	7	0.9	SC
TP-15-26	MA-4	1.30	1.80	37	--	18	46	28	0.7	SC

According to the USCS plasticity chart, this material is a clayey sand of medium plasticity (SC).

Two N values of 3 blows per 300 mm of penetration were measured in the silty sand deposit in borehole BH-15-03 and BH-15-04, indicating a loose deposit.

3.1.1.4 Clay deposit

A clay deposit was encountered in all sounding except the one with refusal on the shallow bedrock in BH-15-04, TP-15-01, TP-15-02, TP-15-07, TP-15-09, TP-15-10, TP-15-12 to TP-15-14, TP-15-24, TP-15-33, TP-15-34 and TP-15-39 or in TP-15-17, TP-15-22, TP-15-28, TP-15-29, TP-15-32 where the bedrock was encountered at greater depths.

The thickness of the clay deposit ranges from 0.10 to 17.9 m. See Table 4 for details of the depths where the deposit was encountered. The clay deposit is mainly composed of a silty, sandy clay to a silt and sand, traces of gravel.

Two grain size analyses were realized on that type of material and yielded the following results (see grain size distribution curves in Figure 2.3 of Appendix 2):

- Fines particles (< 0.08mm): 61 to 74 % whereas the contents in silt and clay were measured 1 time and were of 43 % and 31 % respectively.
- Sand content : 26 to 36 %
- Gravel content : 0 to 3 %

The presence of seashells in large quantity was encountered in the clay deposit in horizon of various depths and locations. The presence of bioturbation at 3.48 m was noted in BH-15-03B and also inclined and horizontal planes in BH-15-06. The picture of three thin-walled tubes that were visually described is presented in Appendix 2. The visual description is also presented in the borelogs of Appendix 1. The presence of

small pieces of seashells in large quantity may have overestimated the percentage of sand present in the samples.

Some clay samples collected during the field work were submitted to geotechnical laboratory testing. The Atterberg limits were determined for 20 samples and the sensibility (S_t) was determined for 3 samples all representative of the clay deposit. The test results are presented in the logs of Appendix 1, in Figures 2.5 and 2.6 of Appendix 2 and in the following Table 6.

Table 6
Characteristics on the clay deposit

Sounding No.	Sample No.	Depth (m)		Water content w (%)	Sensitivity S_t (S_{us}/S_{ur})	Atterberg limits				ASTM D 2487 Classification
		From	To			Plastic limit w_p (%)	Liquid limit w_L (%)	Plasticity index I_p (%)	Liquidity index I_L (%)	
BH-15-03	CF-8	4.57	5.18	58	--	24	50	25	1.4	CL
BH-15-03	CF-13	8.38	8.99	33	--	16	25	9	1.9	CL
BH-15-03	CF-16	10.67	11.28	51	--	18	27	9	3.9	CL
BH-15-03B	TM-7	3.05	3.76	64 65 70	131	25	49	24	1.6	CL
BH-15-06	TM-14	1.22	1.83	31 39 46	>100	17	28	11	2.0	CL
BH-15-08	CF-3	1.22	1.83	32	--	16	36	20	0.8	CL
BH-15-08	CF-6	3.05	3.66	39	--	17	29	13	1.7	CL
BH-15-08	TM-15	3.45	4.16	34	46	--	--	--	--	--
BH-15-14	CF 10	6.10	6.71	43	--	19	31	12	2.1	CL
BH-15-14	CF 13	8.38	8.99	37	--	17	25	9	2.4	CL
TP-15-05	MA-5	1.60	2.10	21	--	16	32	15	0.3	CL
TP-15-08	MA-3	1.00	1.50	32	--	16	36	20	0.8	CL
TP-15-08	MA-6	2.50	3.00	39	--	17	29	13	1.7	CL
TP-15-16	MA-2	0.20	0.70	37	--	19	41	21	0.8	CL
TP-15-16	MA-6	2.20	2.70	29	--	16	32	15	0.8	CL
TP-15-17	MA-7	2.80	3.30	21	--	15	22	7	0.9	CL-ML
TP-15-20	MA-5	2.00	2.50	27	--	15	28	13	0.9	CL
TP-15-21	MA-6	2.30	2.80	48	--	19	38	18	1.6	CL
TP-15-23	MA-4	1.30	1.80	33	--	17	35	18	0.9	CL
TP-15-23	MA-8	3.30	3.70	56	--	19	44	25	1.5	CL

Table 6
Characteristics on the clay deposit

Sounding No.	Sample No.	Depth (m)		Water content w (%)	Sensitivity $S_t (S_{us}/S_{ur})$	Atterberg limits				ASTM D 2487 Classification
		From	To			Plastic limit w_p (%)	Liquid limit w_L (%)	Plasticity index I_p (%)	Liquidity index I_L (%)	
TP-15-26	MA-4	1.30	1.80	37	--	18	46	28	0.7	CL
TP-15-26	MA-8	3.20	3.50	39	--	19	37	19	1.1	CL
TP-15-31	MA-4	1.40	1.90	50	--	22	51	28	1.0	CH

According to the USCS plasticity chart, this material is a silty clay of medium plasticity (CL). Only one sample of this material (TP-15-31, MA-4) is a silty clay of high plasticity (CH).

This deposit has a medium plasticity and values of liquid limit (w_L) that varies from 22 to 51 %. The natural water content (w) was measured 46 times in this deposit and varies from 21 to 70 %.

The natural water content is generally superior to the liquid limit which translates into values of liquidity index superior to 1.0, indicating that the material is sensitive to remoulding. The latter is confirmed by the fall cone penetrometer test result which indicates that this clay deposit is highly to ultra-sensitive².

According to the undrained shear strength (s_u) measured on the field with the Nilcon vane apparatus, the consistency of the clay deposit is soft to stiff. The measured s_u values varies from 15 to 93 kPa while the measured s_r values varies from 1 to 6. The results are integrated in the borehole logs presented in Appendix 1.

Results from the oedometric consolidation tests realized on a sample from boreholes BH-15-03B, BH-15-07 and BH-15-08 are presented in the following table and also in Figures 2.10, 2.14 and 2.18 in Appendix 2.

² Holtz, R. D. Kovacs, W. D. 1981. *An Introduction to Geotechnical Engineering, Prentice-Hall civil engineering and engineering mechanics series*, Prentice-Hall Publishers, Michigan University, 733 p.

Table 7 Oedometric consolidation test									
Borehole No.	Sample No.	Depth (m)		Oedometric consolidation					Humid unit weight γ_h (kN/m ³)
		From	To	e_0	σ'_{vo} (kPa)	σ'_p (kPa)	C_c	C_r	
BH-15-03B	TM-7	3.05	3.76	2.11	17	82	1.21	0.03	15.29
BH-15-06	TM-14	1.22	1.83	1.07	18	152	0.37	0.001	18.10 ⁽¹⁾
BH-15-08	TM-15	3.45	4.16	0.94	29	162	0.30	0.01	18.62

Note
1 Presence of seashells in the sample.

Permeabilities were also measured during the oedometric consolidation test. Three permeability values were measured at different effective stresses. The results are shown in Table 8 and also in figures 2.9 to 2.11 and 2.14 to 2.16 in Appendix 2.

Table 8 Oedometer permeability results					
Borehole No.	Sample No.	Depth (m)		Effective stress, σ'_{vo} (kPa)	Permeability k (cm/s)
		From	To		
BH-15-03B	TM-7	3.05	3.76	63	1.381E-4
				100	1.393E-7
				325	6.400E-9
BH-15-08	TM-15	3.45	4.16	44	5.208E-9
				100	1.305E-9
				326	5.093E-10

3.1.1.5 Silty sand deposit

Under the clay deposit lies a 0.25 to 2.00-m-thick deposit composed of silty sand with some to traces of gravel. The presence of seashells was noted in TP-15-30.

Two grain size analyses were realized on that type of material and yielded the following results (see grain size distribution curve in Figure 2.4 of Appendix 2):

- Fines particles (< 0.08mm) : 21 to 32 %
- Sand content : 56 to 72 %
- Gravel content : 7 to 12 %

One N value of 23 blows per 300 mm of penetration was measured in this silty sand layer, indicating a compact deposit.

3.1.1.6 Gravelly sand deposit

A gravelly sand deposit with traces of silt of 0.37 to 0.61 m in thickness was encountered in boreholes BH-15-06, BH-15-08, BH-15-14. The thin layer usually overlies the bedrock but was found from 2.44 to 3.05 m in BH-15-08. The presence of seashells was also noted in that deposit in BH-15-08. No sample of this material was submitted to laboratory testing.

A single N value of 16 blows per 300 mm of penetration was measured in the gravelly sand layer in borehole BH-15-08, indicating a compact deposit.

3.1.2 Bedrock

The bedrock in the projected concentrator area was encountered at depths varying from 1.00 to 19.15 m. The bedrock was cored in lengths ranging from 2.52 to 9.73 m. Bedrock elevation in the soundings ranges from 47.65 to 67.11 m. The geology of the bedrock is similar from one borehole to another. The percentage of the various minerals is estimated visually from the rock core to give a general idea and it may vary from laboratory analyses. Note that the results of laboratory tests on the rock samples are presented in the boreholes logs in Appendix 1.

3.1.2.1 Petrographic Description

Bedrock features noted during core logging were color, composition, textures and structures. The rock was named on the basis of these observations.

The following Table 9 shows a summary of the geological description of the bedrock encountered in each of the seven boreholes where the bedrock was drilled.

Table 9 Geological Description				
Borehole no.	From (m)	To (m)	Lithology	Description
BH-15-03B	19.15	19.32	Amphibolitized and Foliated Gabbro	Green rock composed mainly of amphibole and feldspar. Finely grained (< 1mm). Intensely foliated at 25° TCA ⁽¹⁾ . Sharp lower contact at 25° TCA (parallel to the foliation).
	19.32	24.60	Granite	Pinkish grey rock composed of quartz, Feldspar Biotite, hornblende and magnetite; Medium to coarse grains. Intensely to lightly foliated from 25 to 40° TCA.

Table 9
Geological Description

Borehole no.	From (m)	To (m)	Lithology	Description
	24.60	25.92	Magnetic Amphibolitized and Foliated Gabbro	Green rock composed mainly of amphibole and feldspar. Fine grains (< 1mm). Intensely foliated at 25° TCA. Sharp upper contact at 40° TCA.
BH-15-04	1.00	10.73	Garnet bearing Gneiss	Grey rock with alternating Feldspar-Quartz-Biotite and Quartz-Feldspar-Garnet bands. Feldspar-Quartz-Biotite bands are finely grained and strongly foliated (foliation at 50° TCA). Quartz-Feldspar-Garnet bands are coarsely grained with Garnet porphyroblasts and massive.
BH-15-05	6.10	8.55	Magnetic Granite	Pink rock composed mainly of Quartz and Feldspar with disseminated Biotite, Hornblende and Magnetite. Rock texture is massive
	8.55	8.71	Amphibolitized Gabbro	Non-magnetic green rock composed mostly of Amphibole and Feldspar. Massive and Medium grains (3-4 mm). Sharp contacts (upper at 25° TCA and lower at 40° TCA).
	8.71	9.29	Brecciated ⁽²⁾ Granite	The Granite is pink and massive. Composed of Quartz, Feldspar with disseminated Biotite and Hornblende. Medium to coarse grains. The Granite is brecciated by a grey, carbonated, fine grains material (hydrothermal or magmatic breccia).
	9.29	10.58	Veined Granite	Same granite as above. Injected by a Stockwerk of Quartz and Carbonates veinlets.
	10.58	12.12	Magnetic Amphibolitized and Foliated Gabbro	Green rock composed mainly of amphibole and feldspar. Medium grains (3-4 mm). Gabbro is intensely carbonated. Intensely foliated at 45° TCA. Sharp contacts (upper contact at 60° TCA. Lower contact at 50° TCA). Fractured and altered zone from 11.75 to 12.05 m.
	12.12	13.69	Magnetic Granite	Pink rock composed mainly of Quartz and Feldspar, with disseminated Biotite. Hornblende and Magnetite. Rock texture is massive. Mylonitic zone developed within the granite between 13.07 and 13.52 m. The mylonitic foliation is from 35 to 40° TCA.
BH-15-06	3.74	9.23	Magnetic Granitic Gneiss	Pinkish grey rock composed of Quartz-Feldspar-Biotite-Magnetite with alternating medium grains, strongly foliated bands and coarse grained Quartz-Feldspar bands. Foliation undulating from 35 to 60° TCA.
	9.23	11.83	Altered Granitic Gneiss	Same rock type than above but moderately to intensely weathered (leaching chloritisation, carbonatation).
BH-15-07	2.08	9.28	Magnetic Granitic Gneiss	Pinkish grey rock composed of Quartz-Feldspar-Biotite-Magnetite with alternating medium grains, strongly foliated bands and coarsely grained Quartz-Feldspar bands. Foliation from 30 to 40° TCA.
BH-15-08	4.97	11.83	Magnetic Granitic Gneiss	Pinkish grey rock composed of Quartz-Feldspar-Biotite-Magnetite with alternating medium grained, strongly foliated bands and coarsely grained Quartz-Feldspar bands. Foliation from 40 to 45° TCA. Presence of a <10mm-thick carbonated fine grained intrusive dykelet at 10.50 m.
	11.83	13.24	Magnetic Gabbro/Diorite dyke	Grey to Green rock composed of Feldspar-Biotite-Hornblende-Magnetite. Medium grained. Lighly foliated.

Table 9 Geological Description				
Borehole no.	From (m)	To (m)	Lithology	Description
BH-15-14	14.09	15.16	Feldspar and Biotite Gneiss	Non-magnetic grey rock composed mostly of Feldspar and Biotite with minor Quartz. Alternating leucocratic Feldspathic bands and Melanocratic Biotite-Feldspar bands. Foliation at 40° TCA.
	15.16	16.61	Altered Feldspar and Biotite Gneiss	Non-magnetic pink rock composed mainly of Hematized Feldspar and Chloritized Biotite. Lightly carbonated. Same rock type as above but intensely weathered.
Note :				
1 TCA : To core axis.				
2 Breccia : Rock composed of older rock fragments intruded and cemented by younger minerals. Mechanisms of brecciation are magmatic, volcanic or hydrothermal.				

3.1.2.2 Joints description

The core angle of joints was measured and the joints were numbered and compiled according to three ranges of orientation: 0 to 30° TCA (sub-vertical joints), 30 to 60° TCA (inclined joints) and 60 to 90° TCA (sub-horizontal joints). An average joint density and an apparent spacing were calculated from the total number of joints. Results are presented in Table 10.

Table 10 Number and core angle of joints								
Borehole no.	From (m)	To (m)	Core Angle Range				Average Joint Density (joints per metre)	Apparent Spacing (mm)
			0-30° TCA Subvertical	30-60° TCA Inclined	60-90° TCA Subhorizontal	Total		
BH-15-03B	19.15	20.08	5	0	3	8	8.6	116.3
	20.08	25.92	1	7	10	18	3.1	324.4
BH-15-04	1.00	10.73	13	15	32	60	6.2	162.2
BH-15-05	6.10	13.69	14	40	33	87	11.5	87.2
BH-15-06	3.74	9.23	14	22	9	45	8.2	122.0
	9.23	11.83	13	7	9	29	11.2	89.7
BH-15-07	2.08	9.28	5	16	29	50	6.9	144.0
BH-15-08	9.16	13.24	10	11	28	49	12.0	83.3
BH-15-14	14.09	16.61	7	5	3	15	6.0	168.0

3.1.2.3 Laboratory testing

Some core samples, selected in collaboration with Hatch, were submitted to laboratory testing to determine the uniaxial compressive strength (ASTM D2938) and/or the indirect tensile strength (Brazilian test) (ASTM D3967) are presented in the following tables. Results are presented in Table 11 and in the borehole logs presented in Appendix 1.

Table 11 Bedrock properties based on laboratory testing						
Borehole no.	From (m)	To (m)	Lithology	Unit weight (kN/m ³)	Uniaxial compressive strength, q _u (MPa)	Indirect tensile strength, T ₀ (MPa)
BH-15-04	1.57	1.66	Garnet bearing gneiss	26.3	202	--
	1.66	1.70	Garnet bearing gneiss	--	--	5.6
	1.76	1.80	Garnet bearing gneiss	--	--	10.6
BH-15-05	8.85	8.94	Brecciated granite	25.3	198	--
	8.94	8.98	Brecciated granite	--	--	13.2
	9.16	9.27	Brecciated granite	24.7	105	--
	11.06	11.15	Magnetic Amphibolitized and Foliated Gabbro	27.2	46	--
BH-15-06	10.64	10.73	Altered Granitic Gneiss	24.4	62	--
BH-15-07	7.74	7.83	Magnetic Granitic Gneiss	26.2	176	--

With an average uniaxial compressive strength about 130 MPa, this rock fall into the R4 grade (Strong) of Hoek & Brown' scale of rock resistance, as shown in Table 3.5 of the Manuel Canadien d'Ingénierie des Fondations of the Canadian Geotechnical Society, edited in 2013.

3.1.2.4 Rock Mass Classification

The classification used to evaluate the geomechanical quality of the rock mass is the Rock Mass Rating³.

The parameters considered in the RMR calculation are the strength of intact rock. The quality of the rock. The spacing and the condition of discontinuities plus the groundwater condition.

³ Bieniawski, Z.T. 1989. *Engineering rock mass classifications*. New York: Wiley.

The RMR rating equation is :

$$\text{RMR (0-100)} = A1 + A2 + A3 + A4 + A5$$

Where :

- A1 : Rate for the Strength of intact Rock (between 0 to 15)
- A2 : Rate for the Drill Core Quality (RQD) (between 0 to 20)
- A3: Rate for Spacing of Discontinuities (between 0 to 20)
- A4 : Rate for Condition of Discontinuities (between 0 to 30)
- A5 : Rate for Groundwater Condition (between 0 to 15)

The RMR ranges from 0 to 100 with corresponding rock quality of :

- 0 to 20 : Very poor Rock;
- 20 to 40 : Poor Rock;
- 41 to 60 : Fair Rock;
- 61 to 80 : Good Rock;
- 81 to 100 : Very good Rock.

The criteria used to evaluate each parameter are described in the following Table 12:

Table 12				
Parameters of the RMR Rock Mass Classification				
Parameter		Maximum corresponding value	Criteria	
A1	Strength of intact rock	15	Based upon the Uniaxial Compressive Strength measured by laboratory testing	
A2	Rock Quality Designation	20	RMR is measured during core logging	
A3	Spacing of discontinuities	20	Apparent spacing based of the number of joint along the core length	
A4 – Conditions of discontinuities	A4a	Persistence	6	Cannot be determined directly by boreholes investigation. A conservative rate of 2 applied which represents a persistence of 3 to 10 m.
	A4b	Aperture	6	Joint aperture has been approximate on the basis of the core length recovery measured during core logging.
	A4c	Roughness	6	Rate based on the condition of the less favorable joint.
	A4d	Infilling	6	Rate based on the condition of the less favorable joint.
	A4e	Weathering	6	Rate based on the condition of the less favorable joint.
A5	Groundwater	15	Dry Condition	

The core length was subdivided in geomechanical zones that were based upon the structural or weathering conditions of the rock. The rock quality was classified for each zone and classifications are presented within the following table:

Table 13 Rock Mass Rating (RMR)					
Borehole no.	From	To	Rate (Dry)	Rock Quality	Description
BH-15-03B	19.15	20.08	60	Fair	Zone with steeply dipping joints with smooth to polished surfaces. Talc weathering. Presence of a fractured zone from 19.88 to 20.00 m.
	20.08	25.92	76	Good	Good to Very good Quality rock. Joint conditions are similar. Most joints are sub-horizontal.
BH-15-04	1.00	10.73	62	Good	A single geomechanical zone. Some joints of various orientations from 1.00 to 4.22 m are possibly slightly open and show an oxidation coating. Weaker joint conditions are observed on the vertical joint at 10.60 m which is coated with fault gouge and where host rock is slightly weathered (Joint Condition Parameters penalized by this joint). Most joints are sub-horizontal.
BH-15-05	6.10	13.69	56	Fair	Minor fractures and/or altered zones are hosted within the granite (brecciated and veined granite). RMR parameters are controlled by the fractured and altered zone developed in a gabbro dyke between 11.75-12.05 m. Some joints within the zone are filled by fault gouge. Host rock is weathered. Most joints are inclined or sub-horizontal.
BH-15-06	3.74	9.23	71	Good	Good Quality Rock. Some joints at low core angle are foliation joints.
	9.23	11.83	53	Fair	Rock is moderately to intensely weathered. Many joints are coated by carbonates and chlorite. Some joints are filled with decomposed rock.
BH-15-07	2.08	9.28	70	Good	Good Quality Rock. Joint Conditions Parameters are penalized by foliation joints coated by chlorite and partly polished.
BH-15-08	9.16	13.24	66	Good	Rock is generally of good quality. Sub-vertical joint set shows chlorite and/or talc coating/infilling. These joints are usually rough and undulating. Presence of a possible open joint near the top of the bedrock (at 5.02 m) explaining the Aperture Joint Condition.
BH-15-14	14.09	16.61	42	Fair	Presence of a "void" zone/open joint/fractured zone between 14.39-14.73 m. From 14.73-16.61 m (end of hole) the rock is moderately to strongly weathered. RMR based upon the "void" zone and upon the weathering.

Details of the RMR for each borehole are presented in Table 1 in Appendix 1, following the borehole and the test pit logs.

3.1.2.5 Borehole lithology and rock quality

Borehole BH-15-03B

The bedrock was intersected at 19.15 m in depth. A gabbro was observed from 19.15 to a granite, observed from 19.32 to 24.60 m. The granite is in contact with another gabbro, found until the end of hole at 25.92 m.

Based upon the structural condition of the rock, the core length was divided in two geomechanical zone, one from 19.15 to 20.08 m and the other from 20.08 to 25.92 m (End of hole).

The first geomechanical zone is characterized by steeply dipping joints with smooth to polished surfaces and talc weathering. A fractured zone is present from 19.88 to 20.00 m. The rock shows an average joint density of 8.6 joints per metre. Most of joints are sub-vertical (core angle at 0 to 30° TCA). Based upon the RMR rating of 60, the quality of the rock is fair.

The second geomechanical zone is weakly fractured with an average joint density of 3.1 joints per metre.

The rock is generally moderately fractured with an average joint density of 6.2 joints per metre. Most joints are sub-horizontal (core angle at 60 to 90° TCA). Some joints of various orientations from 1.0 to 4.22 m are possibly slightly open and show an oxidation coating. Weaker joint conditions are observed on the vertical joint at 10.60 m which is coated with fault gouge and where host rock is slightly weathered.

Based on the RMR Classification, the rock quality is fair (rating of 60). The rock quality suffers from the presence of the vertical joint at 10.60 m.

Borehole BH-15-04

The bedrock was intersected at 1.0 m of depth and is composed of a Garnet bearing Gneiss all along the core length (End of Hole at 7.60 m). The grey rock shows an alternating feldspar-quartz-biotite and quartz-feldspar-garnet bands. Feldspar-quartz-biotite bands are fine grained and strongly foliated (foliation at 50° TCA). Quartz-feldspar-garnet bands are coarse grained with Garnet porphyroblasts and are massive.

The rock is generally moderately fractured, with an average joint density of 6.2 joints per metre. About half of the described joints are sub-horizontal (core angle at 60 to 90°

TCA). A possible open joint is suspected at 1.41 m of depth with an aperture of 10 mm with walls thinly coated by limonite. Some joints of various orientations from 1.0 to 4.22 m are possibly slightly open and show an oxidation coating.

A single geomechanical zone was identified based upon the joint conditions. The rock quality is good (RMR of 62). The rock quality is restricted by the vertical joint at 10.60 m which is coated with fault gouge and where host rock is slightly weathered.

Borehole BH-15-05

The bedrock was intersected at the depth of 6.10 m. Bedrock shows an alternating granite and gabbro.

The granite was intersected from 6.10 to 8.55 m, from 8.71 to 10.58 m and from 12.12 to 13.69 m (EOH). The granite is pink and generally massive. This rock is composed of quartz and feldspar with disseminated biotite and magnetite. The granite is brecciated from 8.71 to 9.29 m, by a grey fine grained carbonated material (hydrothermal or magmatic). The granite is intensely injected from 9.29 to 10.58 m by a stockwerk of quartz and carbonates veinlets. A mylonitic zone is developed within the granite from 13.07 to 13.52 m. The mylonitic foliation has an angle of 35 to 40° TCA.

The gabbro was intersected from 8.55 to 8.71 m and from 10.58 to 12.12 m. The rock is green and medium grained. It is mostly composed of amphibole and feldspar. The gabbro from 8.55 to 8.71 m is massive and non-magnetic. The gabbro from 10.58 to 12.12 m is magnetic, strongly foliated and intensely carbonated. An altered and fractured zone is developed from 11.75 to 12.05 m.

The rock is generally strongly fractured, with an average joint density of 11.5 joints per metre. Most of joints are inclined (core angle at 30 to 60°) and sub-horizontal (core Angle at 60 to 90° TCA). The bedrock is characterized by fractured and/or altered zones.

A single geomechanical zone was identified based upon the joint conditions. The fair rock quality (RMR of 56) is controlled by the fractured and altered zone developed in a gabbro dyke from 11.75-12.05 m. Some joints within the zone are filled by fault gouge. Host rock is weathered.

Borehole BH-15-06

The bedrock was intersected at 3.74 m of depth and is composed of a granitic gneiss all along the core length (end of hole at 11.83 m). The pinkish grey rock is magnetic and shows an alternation of medium grained strongly foliated bands and coarse grained quartz-feldspar bands. The foliation is undulating from 35 to 60° TCA. The rock is moderately to intensely weathered from 9.23 to 11.83 m.

The rock is moderately to strongly fractured, with average joint densities of 8.20 to 11.2 joints per metre. A possible open joint is suspected at 1.41 m of depth with an aperture of 10 mm and walls thinly coated by limonite. Some joints of various orientations from 1.00 to 4.22 m are possibly slightly open and show an oxidation coating.

Based upon the structural condition of the rock, the core length was divided in two geomechanical zones, the first from 3.74 to 9.23 m and the second from 9.23 to 11.83 m (end of hole).

The zone from 3.74 to 9.23 m is characterized as good quality rock (RMR of 71).

The rock quality within the other zone (9.23 to 11.83 m) is fair (RMR of 53). The rock is moderately to intensely weathered. Many joints are coated by carbonates and chlorite. Some joints are filled with decomposed rock.

Borehole BH-15-07

The bedrock was intersected at 2.08 m of depth and is composed of a magnetic granitic gneiss over the complete core length (end of hole at 9.28 m). The pinkish grey rock is composed of quartz-feldspar-biotite-magnetite. The rock shows an alternation of medium grained strongly foliated bands and coarse grained quartz-feldspar bands. The foliation is from 30 to 40° TCA.

The rock is moderately fractured, with an averaged joint density of 6.9 joints per metre. More than half of joints are sub-horizontal (Core angle between 60 to 90°).

A single geomechanical zone was defined based upon the joint conditions. The rock quality is good (RMR of 70). Some foliation joints are coated with chlorite and partly polished.

Borehole BH-15-08

The bedrock was intersected at 4.97 m of depth. The bedrock is composed of a magnetic granitic gneiss, from 4.97 to 11.83 m, and is in contact with a magnetic gabbro or diorite.

The granitic gneiss is pinkish grey and composed of quartz-feldspar-biotite-magnetite. The foliation is at 40 to 45° TCA. The gneiss is cross-cut by a less than 10-mm-thick carbonated fine grained dykelet.

The gabbro is grey to green and composed of feldspar-biotite-hornblende-magnetite. The rock is medium grained and gently foliated.

The rock is strongly fractured, with an average joint density of 12.0 joints per meter. More than half of joints are sub-horizontal (core angle between 60 to 90°).

A single geomechanical zone was defined based upon the joint conditions. The rock quality is good (RMR of 66). The rock is generally of good quality. The subvertical joint set shows chlorite and/or talc coating and/or infilling. These joints are usually rough and undulating. The presence of a possible open joint near the top of the bedrock (at 5.02 m) penalizes joint condition parameters.

Borehole BH-15-14

The bedrock was intersected at 14.09 m in depth and is composed of a feldspar and biotite gneiss all along the core length (end of hole at 16.61 m). The gneiss is intensely weathered.

The rock is moderately fractured, with an average joint density of 6.0 joints per meter. About half of joints are sub-vertical (core angle between 0 to 30°).

A single geomechanical zone was defined based upon the joint conditions. The rock quality is fair (RMR of 42). The rate is based upon the void zone or open joint or fractured zone between 14.39 and 14.73 m. From 14.73 to 16.61 m, the rock is moderately to strongly weathered.

3.2 GROUNDWATER CONDITIONS

Groundwater levels were measured at every borehole location and are presented in the following Table 14.

Table 14
Water level measurements in the boreholes

Borehole No.	Type of installation	Elevation of surface (m)	Date of measurement	Water level measurement reference	Height of the reference above-ground (m)	Water level ⁽²⁾ (m)	Water level elevation (m)
BH-14-01 ⁽¹⁾	Stand pipe	70.58	2015-10-18	Top of PVC casing	0.99	1.67	69.90
BH-14-02(1)	Stand pipe	72.43	2015-10-18	Top of PVC casing	0.93	0.98	72.38
BH-15-03	Stand pipe	67.69	2015-10-18	Top of PVC casing	0.89	1.00	67.58
BH-15-04	Stand pipe	69.75	2015-10-18	Top of PVC casing	0.95	1.90	68.80
BH-15-05	Stand pipe	69.81	2015-10-18	Top of PVC casing	0.92	1.13	69.60
BH-15-07	Casagrande piezometer ⁽³⁾	68.79	2015-10-18	Top of PVC casing	0.97	0.99	68.77
BH-15-08	Stand pipe	72.08	2015-10-18	Top of PVC casing	0.97	2.70	70.35

Notes :

- 1 Borehole drilled in previous mandate Qualitas file no. 626738.
- 2 Referring to the water level measured from the top of the PCV casing.
- 3 Depth interval of the porous tip of the Casagrande piezometer (1.68 to 1.98 m).

It should be noted that groundwater levels can change according to climatic conditions and that they are subjected to seasonal variations.

APPENDIX 1

EXPLANATORY NOTES ON BOREHOLE AND TEST PIT LOG
BOREHOLE AND TEST PIT LOGS
TABLE 1.1: ROCK MASS RATING DETAILS

EXPLANATORY NOTES

BOREHOLE AND TEST PIT LOG

(page 1 of 2)

The object of the borehole and test pit log is to present field and laboratory data concerning soil, bedrock and groundwater conditions. The purpose of this note is to explain the terminology, symbols and abbreviations used on the log.

STRATIGRAPHY

1. DEPTH - ELEVATION

The depth and elevation of contacts between the various geological strata are given in relation to the ground surface at the borehole or test pit location. Elevations refer to a datum as specified in the general heading of the log.

2. SOIL DESCRIPTION

Soils are described according to their physical and geotechnical properties.

Soil particle size classification is given below:

<u>IDENTIFICATION</u>	<u>PARTICLE SIZE (mm)</u>	
Clay	<	0.002
Silt	0.002 -	0.08
Sand	0.08 -	5
Gravel	5 -	80
Cobble	80 -	300
Boulder	>	300

The proportion of each soil constituent, as identified by the particle size range, is defined by the following descriptive terms:

<u>DESCRIPTION</u>	<u>PARTICLE SIZE FRACTION (%)</u>	
Trace	1 -	10
Some	10 -	20
Adjective (ex.: sandy silt, silty)	20 -	35
And (ex.: sand and gravel)	>	35

2.1 STATE OF COMPACTNESS OF COHESIONLESS SOILS

The state of compactness of cohesionless soils is evaluated using the "N-value" obtained during the Standard Penetration Test (SPT).

<u>COMPACTNESS</u>	<u>N-VALUE (blows / 300 mm)</u>	
Very loose	<	4
Loose	4 -	10
Compact	10 -	30
Dense	30 -	50
Very dense	>	50

2.2 CONSISTENCY AND PLASTICITY OF COHESIVE SOIL

The consistency of cohesive soils is defined by the undrained shear strength. The undrained shear strength of the intact clay (s_u) and remoulded clay (s_r) is measured in situ or in the laboratory.

<u>CONSISTENCY</u>	<u>UNDRAINED SHEAR STRENGTH, s_u (kPa)</u>	
Very soft	<	12
Soft	12 -	25
Firm	25 -	50
Stiff	50 -	100
Very stiff	100 -	200
Hard	>	200

<u>DEGREE OF PLASTICITY</u>	<u>LIQUID LIMIT, w_L (%)</u>	
Low	<	30
Medium	30 -	50
High	>	50

3. ROCK DESCRIPTION

Rock is described according to its geological origin, composition, structural characteristics and mechanical properties.

The Rock Quality Designation (RQD) is determined according to the ASTM D 6032 Standard.

<u>CLASSIFICATION</u>	<u>RQD VALUE (%)</u>	
Very poor quality	<	25
Poor quality	25 -	50
Fair quality	50 -	75
Good quality	75 -	90
Excellent quality	90 -	100

<u>JOINT SPACING CLASSIFICATION</u>	<u>SPACING WIDTH (mm)</u>	
Extremely close	0 -	60
Close	60 -	200
Moderately close	200 -	600
Wide	600 -	2000
Very wide	>	2000

<u>STRENGTH</u>	<u>UNCONFINED COMPRESSIVE STRENGTH, q_u (MPa)</u>	
Extremely weak	<	1
Very weak	1 -	5
Weak	5 -	25
Medium strong	25 -	50
Strong	50 -	100
Very strong	100 -	250
Extremely strong	>	250

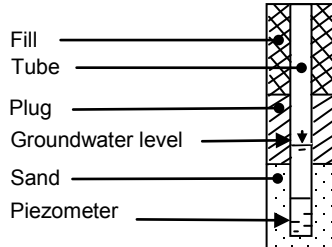
EXPLANATORY NOTES

BOREHOLE AND TEST PIT LOG

(page 2 of 2)

GROUNDWATER LEVEL

The column "Groundwater Level" gives the groundwater level measured in a stand pipe, piezometer, monitoring well or directly in the borehole or test pit. The survey date is also indicated in this column. The sketch opposite illustrates the different symbols used.



ABBREVIATIONS

A	Absorption, L/min-m (Packer Test in rock)
CA	Chemical analysis
C	Consolidation test
C _c	Curvature coefficient
C _U	Uniformity coefficient
s _u	Intact undrained shear strength, measured with the field vane, kPa
s _r	Remoulded undrained shear strength, measured with the field vane, kPa
s _{us}	Intact undrained shear strength, measured with the Swedish fall-cone, kPa
s _{rs}	Remoulded undrained shear strength, measured with the Swedish fall-cone, kPa
s _{up}	Intact undrained shear strength, measured with the portable vane apparatus, kPa
s _{rp}	Remoulded undrained shear strength, measured with the portable vane apparatus, kPa
D _r	Relative density
E _M	Pressuremeter modulus, kPa or MPa
G	Particle size distribution by sieve and washing
I _L	Liquidity index
I _p	Plasticity index, %
k _c	Coefficient of permeability (hydraulic conductivity), measured in situ, m/s
k _L	Coefficient of permeability (hydraulic conductivity), measured in the laboratory, m/s
N _{dc}	Dynamic cone penetrometer blow count (DCPT)
N	Standard penetration test (SPT) index
P ₈₀	Sieve analysis by washing on the 80 μm sieve
P _L	Pressuremeter limit pressure, kPa
P _r	Proctor Test
γ	Unit weight, kN/m ³
γ'	Effective unit weight, kN/m ³
q _u	Unconfined compressive strength of rock, MPa
R	Split spoon penetration refusal
S	Particle size distribution by hydrometer testing
S _t	Sensitivity (s _u /s _r)
CPV	Corrosivity point value
w	Water content, %
w _L	Liquid limit, %
w _p	Plastic limit, %

SAMPLES

1. TYPE AND NUMBER

The column "Type and Number" corresponds to the sample number. It includes 2 letters indicating the sample type followed by a sequence number. The sample types are as follows:

SS : Split spoon	RC : Rock core
LS : Large diameter sampler	GS : Grab sample
TW : Thin wall tube	AS : Auger sample
TU : Geoprobe™ sampling tube	

2. CONDITION

The depth, strength and condition of each sample is given in this column. The following symbols indicate the condition of the sample:



3. RECOVERY

Sample recovery corresponds to the recovered length of the sample in relation to the length of penetration of the sampler, expressed in percentage. The sample length is equal to the distance from the top of the sampler to the cutting edge whether or not the lower part of the sample is lost.

IN SITU AND LABORATORY TESTS

In situ and laboratory test results are indicated in the column "In Situ and Laboratory Tests" at the corresponding depth.

The following list of abbreviations identifies these tests.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-03

DATE : 2015-10-03 2015-10-03
UTM COORDINATES : UTM 19 NAD83
E : 555256.36 **N** : 5452470.03

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2015-10-18 67.58 m	SAMPLES		IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS								
								W _p	W _L		▲ S _u (kPa) ▽ S _{us} (kPa) ★ S _r (kPa) ⊛ S _{rs} (kPa) ○ N _{dc} (blows/300 mm)							
20	40	60	80	20	40	60	80											
1	67.69	Dark brown peat layer, very slightly decomposed (Von Post: H3).		CF-1	16													
2	66.70	Grey silty sand, traces of gravel.		CF-2A	68						N: <1							
3	65.55	Grey silty clay (CL) of low to medium plasticity, traces of sand.		CF-2B	100													
4				CF-3	100	3												
5				CF-4A	100						N: <1							
6				CF-4B	100						N: <1							24▲
7				CF-5	100						N: <1							
8				CF-6	100						N: <1							*1 23▲
9				CF-7	100						N: <1							20▲
10		Presence of seashells from 4.57 to 8.99 m.		CF-8	100						N: <1		24	50	58			
11				CF-9	100						N: <1							*5 31▲
12				CF-10	66	1					N: <1							35▲
13				CF-11	100						N: <1							*3 30▲
14				CF-12	66	1												25▲

COMMENTS:

DRILLING METHOD : CME-55 (Forage André Roy inc.)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-03
DATE : 2015-10-03 2015-10-03
UTM COORDINATES : UTM 19 NAD83
E : 555256.36 **N** : 5452470.03

DEPTH (m)	ELEVATION (m) <small>Geodesic</small>	DESCRIPTION	WATER LEVEL 2015-10-18	SAMPLES			IN SITU AND LABORATORY TESTS									
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)				OTHER TESTS				
								w_p	w	w_L						
10			2015-10-18	CF-13	X	100		1625	33	N: <1						
11				CF-14	X	100				N: <1	★1	37▲				
12	11.43	56.26		CF-15	X	100				N: <1		32▲				
13		Assumed silty clay. Start of the dynamic cone penetrometer test (DCPT).		CF-16	X	100		1827	51	N: <1	★15▲					
14											Weight	0				
15												Weight	0			
16												Weight	0			
17												Weight	0			
												Weight	0			
												Weight	0			
												Weight	0			
												Weight	0			
												Weight	0			



COMMENTS:

DRILLING METHOD : CME-55 (Forage André Roy inc.)

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CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-03B
DATE : 2015-10-14
UTM COORDINATES : UTM 19 NAD83
E : 555257.67 **N** : 5452466.97

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL	SAMPLES			IN SITU AND LABORATORY TESTS											
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS	$\blacktriangle S_u$ (kPa) ∇S_{us} (kPa) $\star S_r$ (kPa) $\otimes S_{rs}$ (kPa)								
										$\circ N_{dc}$ (blows/300 mm)								
							W_p W_L 											
10				TM-9														
11																		
12	11.40	56.28																
		Assumed grey silty clay.																
13																		
14																		
15																		
16																		
17																		

COMMENTS: TCA: To core axis.
 This borehole was drilled 3.40 meters from BH-15-03, in the South-East direction.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

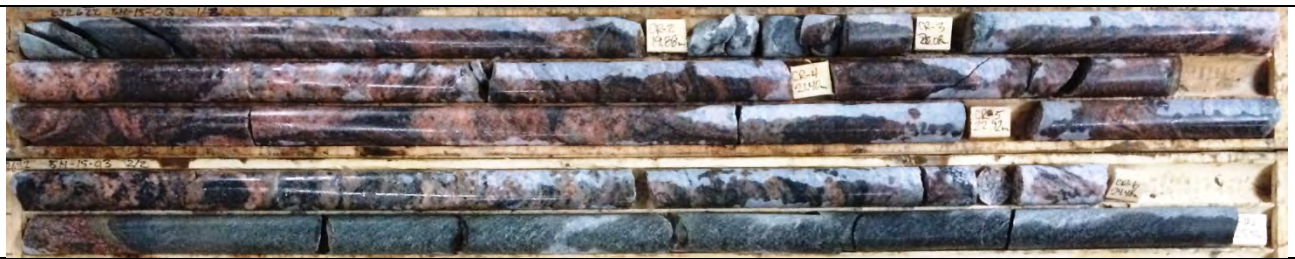
CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-03B



Depth from 19.15 to 25.92 m (dry)



Depth from 19.15 to 25.92 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-04

DATE : 2015-09-30
UTM COORDINATES : UTM 19 NAD83
E : 555384.60 **N** : 5452356.55

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2015-10-18 68.80 m	SAMPLES			IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS									
								W_p	W_L		S_u (kPa)	S_{us} (kPa)	S_r (kPa)	S_{rs} (kPa)	N_{dc} (blows/300 mm)				
0.11	69.75	Silty organic matter.																	
0.64	69.64	Grey silty sand, traces of gravel.		CF-1	X	100						N: 1/12cm-1-2-1							
1.00	68.75	Bedrock: garnet bearing gneiss. Grey color. Presence of alternating feldspar-quartz-biotite bands and quartz-feldspar-garnet bands. Feldspar-quartz-biotite bands are fine grained and strongly foliated (foliation at 50° TCA). Quartz-feldspar-garnet bands are massive and coarse grained with garnet porphyroblasts.		CF-2	X	100						N: 6-50/7cm							
				CR-3	█	100	97												
				CR-4	█	99	99						T_0 : 5.6 MPa T_G : 10.6 MPa q_u : 202 MPa						
				CR-5	█	100	82												
				CR-6	█	99	96												
				CR-7	█	97	87												
				CR-8	█	100	100												

COMMENTS: TCA: To core axis.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

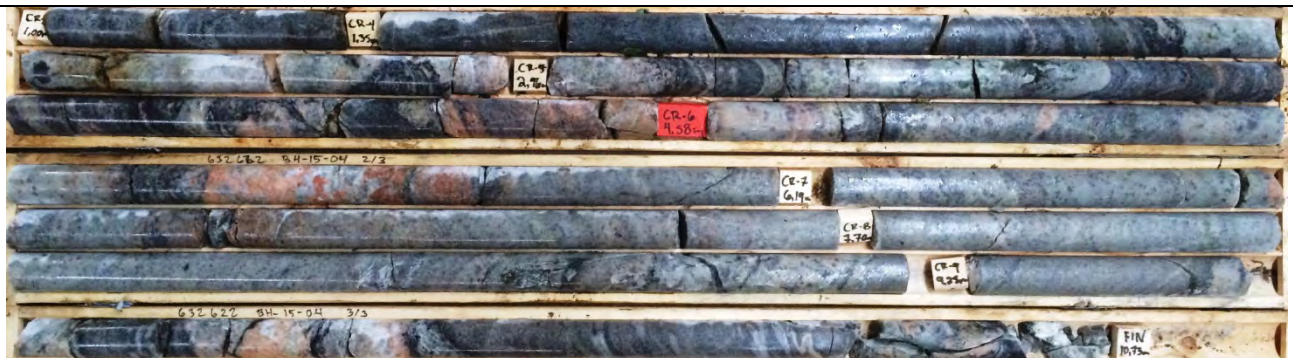
CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-04



Depth from 1.00 to 10.73 m (dry)

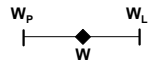
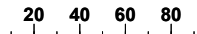


Depth from 1.00 to 10.73 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-05

DATE : 2015-09-29 2015-09-30
UTM COORDINATES : UTM 19 NAD83
E : 555426.42 **N** : 5452322.01

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES				IN SITU AND LABORATORY TESTS								
			TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	▲ S_u (kPa) ▽ S_{us} (kPa) ★ S_r (kPa) ⚙ S_{rs} (kPa)					
							W_p	W_L		○ N_{dc} (blows/300 mm)					
															
0.23	69.81	Silty organic matter. Presence of roots.													
	69.58	Grey silty clay.	CF-1	X	66	8									
1		Presence of seashells from 1.2 to 4.27 m.	CF-2	X	100	2									
2			CF-3	X	100					N: 1-1-1/30cm					90▲
			CF-4	X	100					N: 1/30cm-1/30cm					
3			CF-5	X	33					N: <1					60▲
			CF-6	X	100					N: 0/15cm-1-1-0/15cm					
4		Grey silty sand, traces of gravel.	CF-7	X	75	1									
5	4.27		65.54	CF-8	X	57	23			G					
			CF-9	X	0					N: Refusal					
6		Bedrock: magnetic granite. Pink color. Composed mainly of quartz and feldspar with disseminated biotite, hornblende and magnetite. Rock texture is massive.	CF-10	X	23					N: 5-7-50/5cm					
7	6.10		63.71	CR-11	X	100	78								
8			CR-12	X	100	57					T_0 : 13.2 MPa q_u : 198 MPa				

COMMENTS: TCA: to core axis.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-05



Depth from 6.10 to 13.69 m (dry)

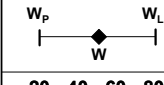


Depth from 6.10 to 13.69 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-06

DATE : 2015-10-02
UTM COORDINATES : UTM 19 NAD83
E : 555383.96 **N** : 5452436.45

DEPTH (m)	ELEVATION (m) <small>Geodesic</small>	DESCRIPTION	WATER LEVEL	SAMPLES			IN SITU AND LABORATORY TESTS							
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS				
								W_p	W_L					
	68.54							W_p — W — W_L 		▲ S_u (kPa) ▽ S_{us} (kPa) ★ S_r (kPa) ✱ S_{rs} (kPa) ○ N_{dc} (blows/300 mm)	20 40 60 80	20 40 60 80		
0.61	67.93	Brown silty sand. Presence of organic matter.		CF-1	[X]	33	1							
1		Silty clay (CL) of low plasticity. Brown, becoming grey at 1.28 m. Firm to stiff consistency. Ultrasensitive. Presence of inclined and horizontal planes from 1.52 to 1.59 m. Presence of seashells.		CF-2	[X]	50	4							
2				TM-14 CF-3	[Hatched]	100	4	17 28 39 46	γ : 18,1 kN/m ³ C	60 31.8 77				
3				CF-4	[X]	100	100		N: <1	30 74				
3	65.49	Silty sand, traces to some of gravel.		CF-5	[X]	100	2							
3	65.19	Grey gravelly sand, traces of silt.		CF-6A CF-6B	[X]	100	100		N: 17-11-refus					
4	64.80	Bedrock: magnetic granitic gneiss. Pinkish Grey color. Composed of quartz-feldspar-biotite-magnetite wich alternates between medium grained, strongly foliated bands and coarse grained quartz-feldspar bands. Foliation undulating from 35° to 60° TCA.		CR-7	[Solid]	100	100							
5				CR-8	[Solid]	100	77							
6				CR-9	[Solid]	97	79							
7				CR-10	[Solid]	100	78							
8				CR-11	[Solid]	100	60							

COMMENTS: TCA: to core axis.
 Sample TM-14 was collected next to borehole BH-15-06.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-06

DATE : 2015-10-02
UTM COORDINATES : UTM 19 NAD83
E : 555383.96 **N** : 5452436.45

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL	SAMPLES			IN SITU AND LABORATORY TESTS											
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%) W_p W_L W	OTHER TESTS	$\blacktriangle S_u$ (kPa) ∇S_{us} (kPa) $\star S_r$ (kPa) $\boxtimes S_{rs}$ (kPa)								
										$\bigcirc N_{dc}$ (blows/300 mm)								
9.23	59.31	Altered granitic gneiss. Same rock type than above but moderately to intensely weathered (leaching, chloritisation and carbonatation).		CR-11		100	60											
11.83	56.71		CR-12		100	59												
11.83	56.71		CR-13		95	79												
		End of borehole																

COMMENTS: TCA: to core axis.
 Sample TM-14 was collected next to borehole BH-15-06.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-06



Depth from 3.74 to 11.83 m (dry)



Depth from 3.74 to 11.83 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-07

DATE : 2015-10-01 2015-10-01
UTM COORDINATES : UTM 19 NAD83
E : 555431.20 **N** : 5452433.70

DEPTH (m)	ELEVATION (m) <small>Geodesic</small>	DESCRIPTION	WATER LEVEL 2015-10-18 68.77 m	SAMPLES			IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS									
								w_p	w_L										
	68.79	Silty organic matter.		CF-1		26	4												
0.61	68.18	Grey silty sand, traces of gravel.		CF-2		98	1												
1.01	67.88	Grey silty clay, traces of sand.		TM-3		100													
1.83	66.96	Grey silty sand, traces of gravel.		CF-4		53						N: Refusal							
2.08	66.71	Bedrock: magnetic granitic gneiss. Pinkish grey color. Composed of quartz-feldspar-biotite-magnetite which alternates between medium grained strongly foliated bands and coarse grained quartz-feldspar bands. Foliation from 30° to 40° TCA.		CR-5		95	78												
				CR-6		100	58												
				CR-7		95	91												
				CR-8		97	97												
				CR-9		97	56					q_u : 176 MPa							
				CR-10		100	88												

COMMENTS: TCA: to core axis.
 Sample TM-3 was collected next to borehole BH-15-07.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-07



Depth from 2.08 to 9.28 m (dry)



Depth from 2.08 to 9.28 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-08

DATE : 2015-10-04 2015-10-05
UTM COORDINATES : UTM 19 NAD83
E : 555512.65 **N** : 5452494.05

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2015-10-18	SAMPLES			IN SITU AND LABORATORY TESTS													
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	$\blacktriangle S_u$ (kPa) ∇S_{us} (kPa) $\star S_r$ (kPa) $\otimes S_{rs}$ (kPa) $\circ N_{dc}$ (blows/300 mm)									
								W_p	W_L		W	20	40	60	80					
	72.08																			
0.35	71.73	Sandy organic matter. Presence of roots.		CF-1A		57	3													
		Beige silty clay (CL), traces of gravel.		CF-1B		100	3													
				CF-2		100	10													
				CF-3		57	3	16	36	32										
		Presence of seashells from 1.83 to 2.44 m.		CF-4		62	5													
2.44	69.64	Brown gravelly sand, traces of silt. Presence of seashells.		CF-5A		55	16													
3.05	69.03	Grey silty clay (CL) of medium plasticity, traces of sand. Firm consistency, highly sensitive.		CF-5B		100	16													
				CF-6		100		17	29	39										
				TM-15				19	37	39										
				CF-7		100	0													
		Presence of 2 cobbles from 4.57 to 4.97 m.		CF-8		73														
4.97	67.11	Bedrock: magnetic granitic gneiss. Pinkish grey color. Composed of quartz-feldspar-biotite-magnetite which alternates between medium grained, strongly foliated bands and coarse grained quartz-feldspar bands. Foliation from 40° to 45° TCA. Presence of a <10mm thick carbonated fine grained intrusive dykelet at 10.50 m.		CR-9		91	85													
				CR-10		100	95													
				CR-11		100	73													

COMMENTS: Sample TM-15 was collected next to borehole BH-15-08.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

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CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-08



Depth from 4.97 to 13.24 m (dry)



Depth from 4.97 to 13.24 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-14

DATE : 2015-10-05 2015-10-06
UTM COORDINATES : UTM 19 NAD83
E : 555514.11 **N** : 5452309.41

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL	SAMPLES			IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS									
								W_p	W_L		S_u (kPa)	S_{us} (kPa)	S_r (kPa)	S_{rs} (kPa)	N_{dc} (blows/300 mm)				
20	40	60	80	20	40	60	80												
0.61	70.09	Brown silty sand. Presence of organic matter.		CF-1		61	2												
1.83	69.48	Grey silty sand. Presence of seashells.		CF-2		38	1												
				CF-3		16					N: <1								
	68.26	Grey silty clay (CL) of low to medium plasticity, traces of sand. Presence of seashells from 3.05 to 6.10 m.		CF-4		100					N: <1								
				CF-5		46					N: <1								
				CF-6		100					N: <1								
				CF-7		100	2												
				CF-8		100					N: <1								
				CF-9		100	3												
				CF-10		100					N: <1								
				CF-11		100					N: <1								
				CF-12		80					N: <1								

COMMENTS: TCA: to core axis.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

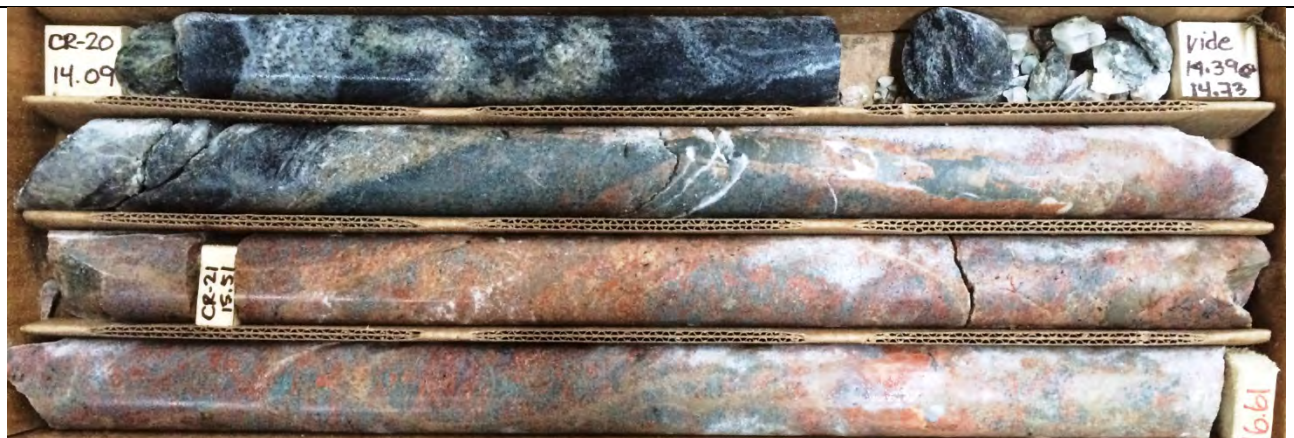
CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622

Borehole core pictures

BH-15-14



Depth from 14.09 to 16.61 m (dry)



Depth from 14.09 to 16.61 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-01
DATE : 2015-10-05
COORDINATES : UTM 19 NAD83
E : 555466.45 **N** : 5452544.45

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	74.19	Sandy organic matter.	MA-1	X		
0.20	73.99	Light brown silty sand, traces of gravel. Presence of cobbles (5%).	MA-2	X		
1.20	72.99	Bottom of the test pit. Refusal on bedrock.	MA-3	X	18	G

COMMENTS:

Bedrock dipping approximately 25° in the South direction and becoming horizontal near the South wall of the trench. See the following drawing for further details. The percentage of cobbles and/or blocks were estimated after a visual inspection.

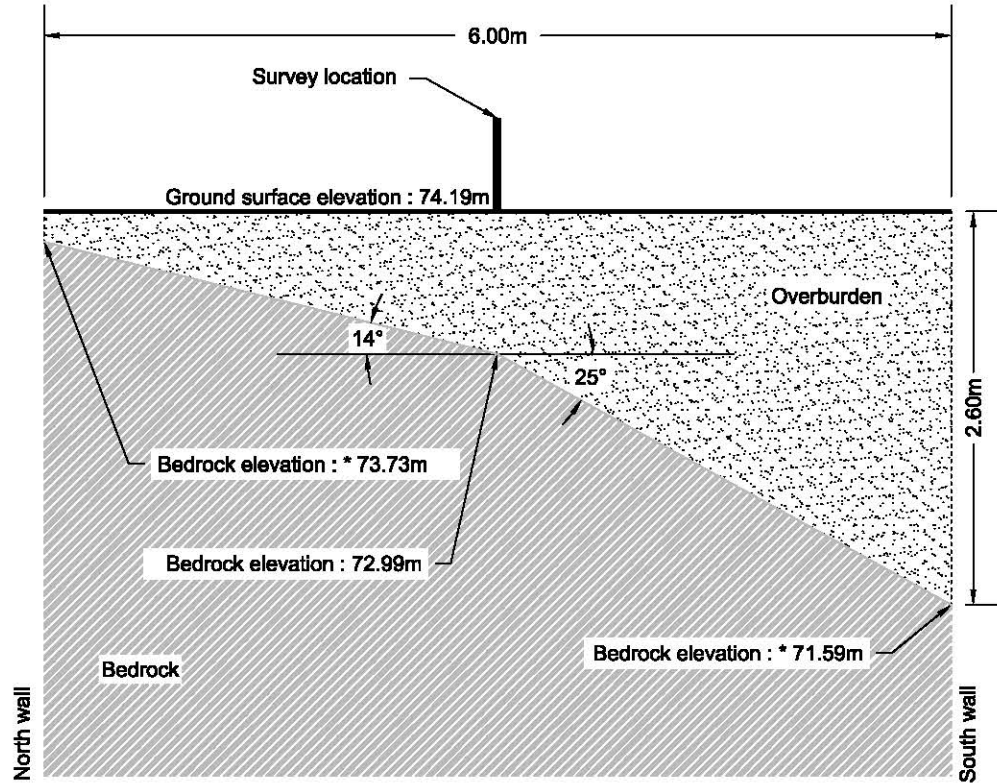

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

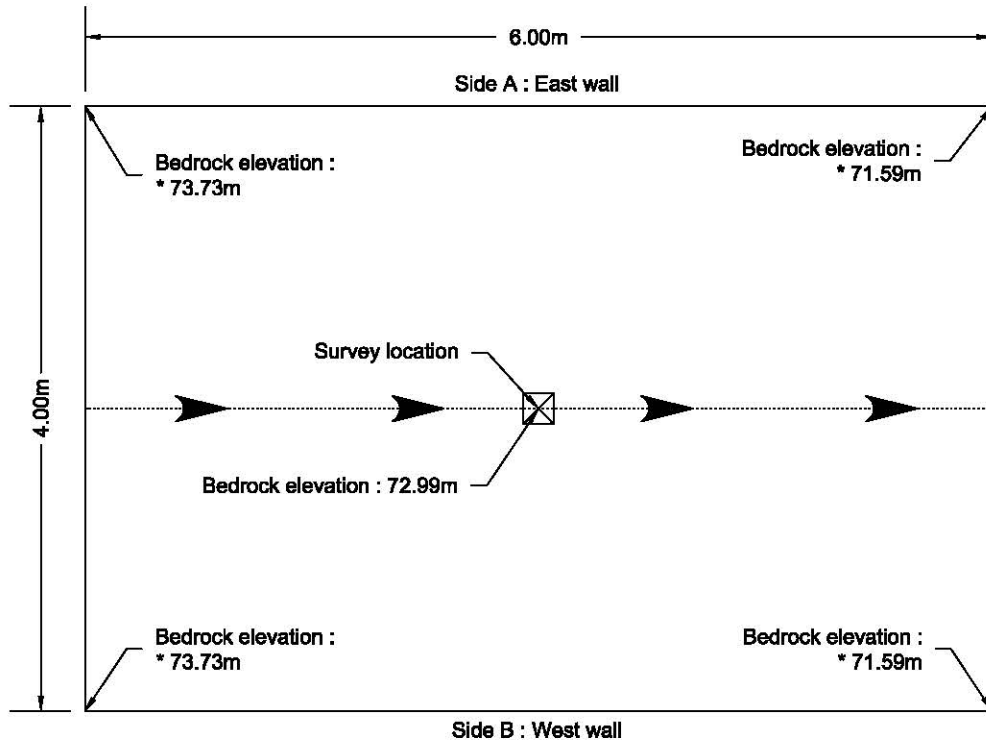
TP-15-01



Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-01



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-02
DATE : 2015-09-30
COORDINATES : UTM 19 NAD83
E : 555372.04 **N** : 5452479.87

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
0.15	70.94	Organic matter and moss.	MA-1	X		
		Bottom of test pit. Refusal on bedrock.				

COMMENTS:
 Step-like bedrock dip approximately 20° in the North direction. See the following drawing for further details.



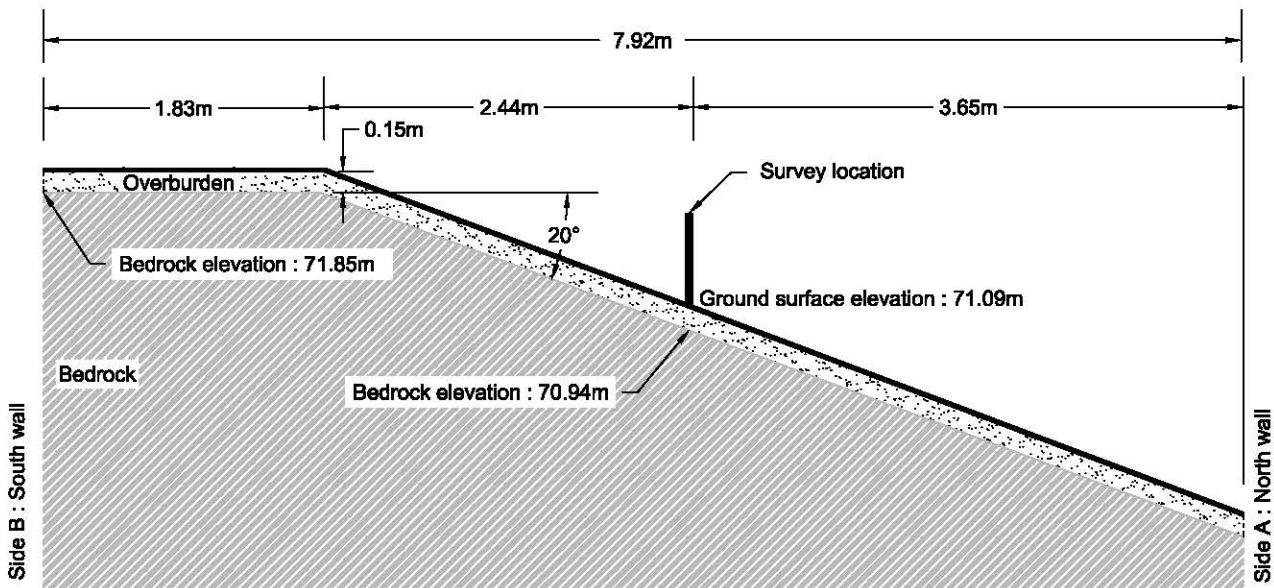
EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 6.4m x 7.9m

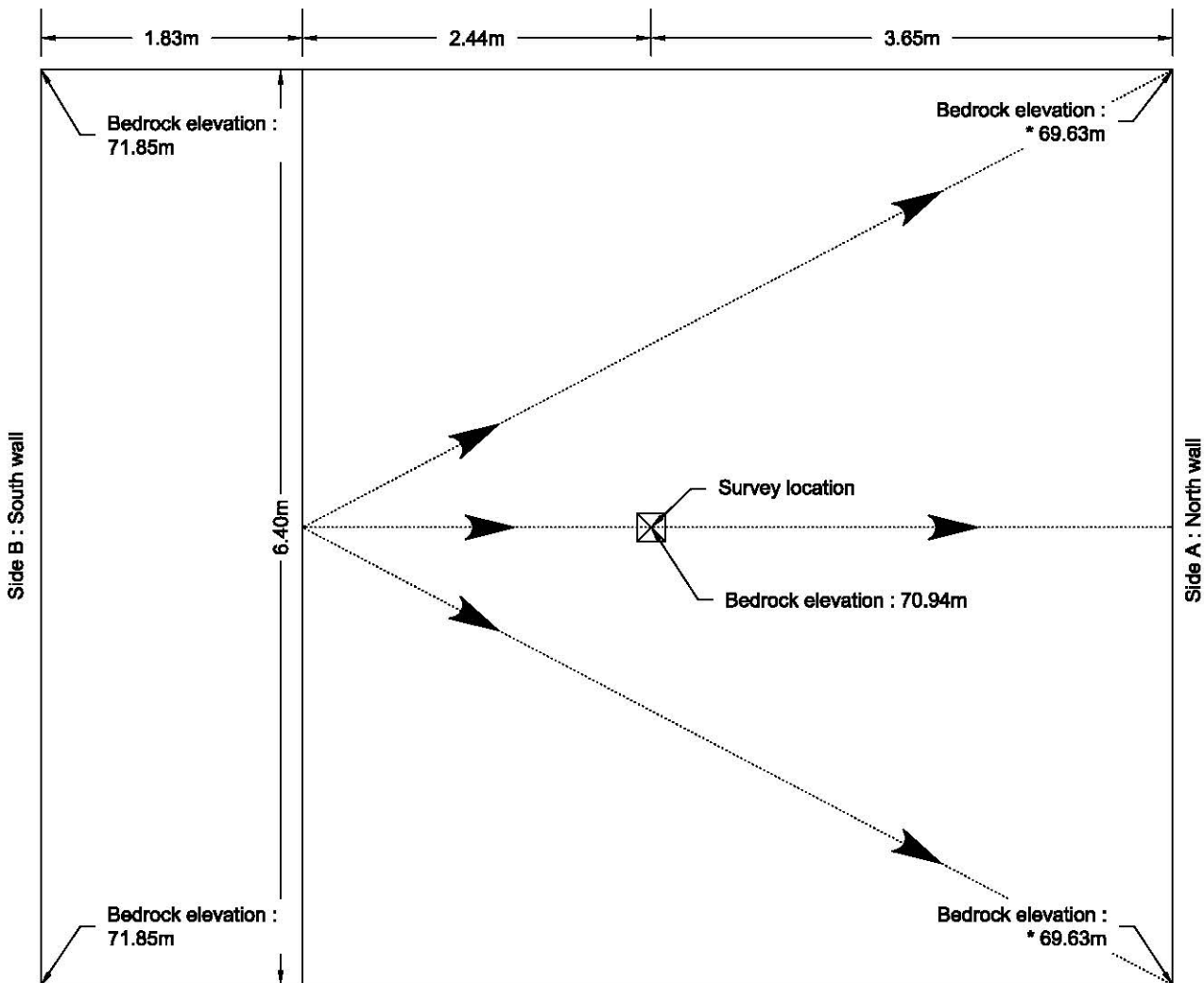


TP-15-02

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-02



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-03
DATE : 2015-09-30
COORDINATES : UTM 19 NAD83
E : 555335.49 **N** : 5452439.00

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
	67.97						
0.25	67.72	Organic matter. Presence of roots and topsoil.	MA-1	X			
		Brown sand, traces of gravel.	MA-2	X			
0.50	67.47	Beige silty sand, some clay.	MA-3	X	◆ 23		D _r = 2,748 S
			MA-4	X			
			MA-5	X			
1.30	66.67	Grey silty clay.	MA-6	X			
			MA-7	X			
			MA-8	X			
3.10	64.87	Bottom of test pit. Refusal on bedrock.					

COMMENTS:

Visible seepage at 0.9 m on the South-West wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-03



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-04
DATE : 2015-09-30
COORDINATES : UTM 19 NAD83
E : 555318.54 **N** : 5452421.37

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
			20	40	60	80	
	68.81	Organic matter. Presence of roots and topsoil.	MA-1	X			
0.30	68.51	Oxidated red sand.	MA-2	X			
0.80	68.01	Beige sand, traces of gravel and silt.	MA-3	X			
			MA-4	X			
1.80	67.01	Grey silty clay.	MA-5	X			
2.30	66.51	Bottom of the test pit. Refusal on bedrock.					

COMMENTS:
 Bedrock is sub-horizontal.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.5m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-04



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-05
DATE : 2015-09-30
COORDINATES : UTM 19 NAD83
E : 555404.60 **N** : 5452411.41

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20 40 60 80				
	69.82	Sandy organic matter. Presence of roots.	MA-1	X			
0.30	69.52	Light brown silty sand becoming grey at 1.10 m, traces to some gravel. Presence of organics.	MA-2	X			
			MA-3	X	20		G
			MA-4	X			
1.60	68.22	Grey silty clay of medium plasticity (CL).	MA-5	X	16, 32 21		
			MA-6	X			
			MA-7	X			
			MA-8	X			
3.60	66.22	Bottom of test pit. Refusal on bedrock.					

COMMENTS:

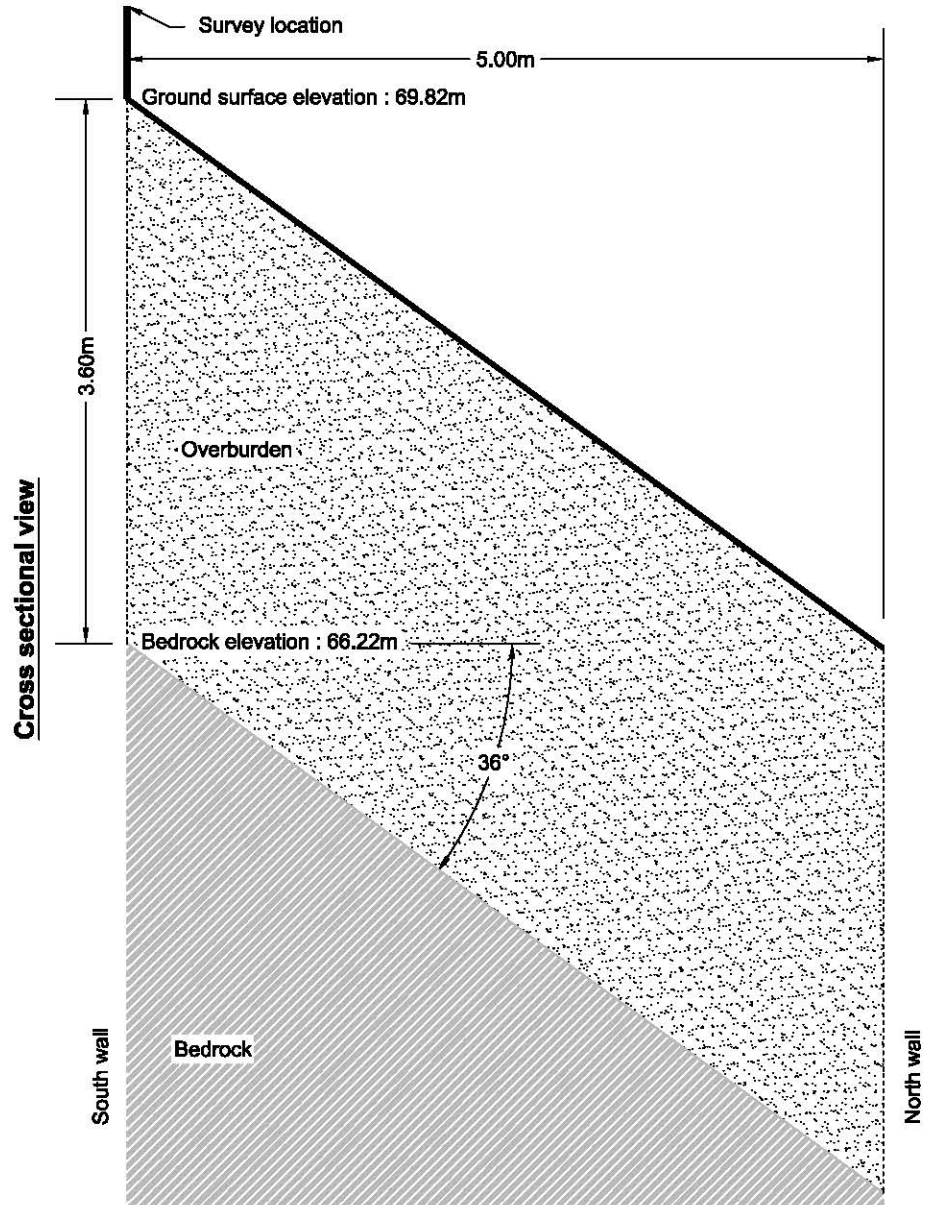
Step-like bedrock dipping approximately 36° in the North direction. See the following drawing for further details.


EQUIPMENT : Komatsu PC138

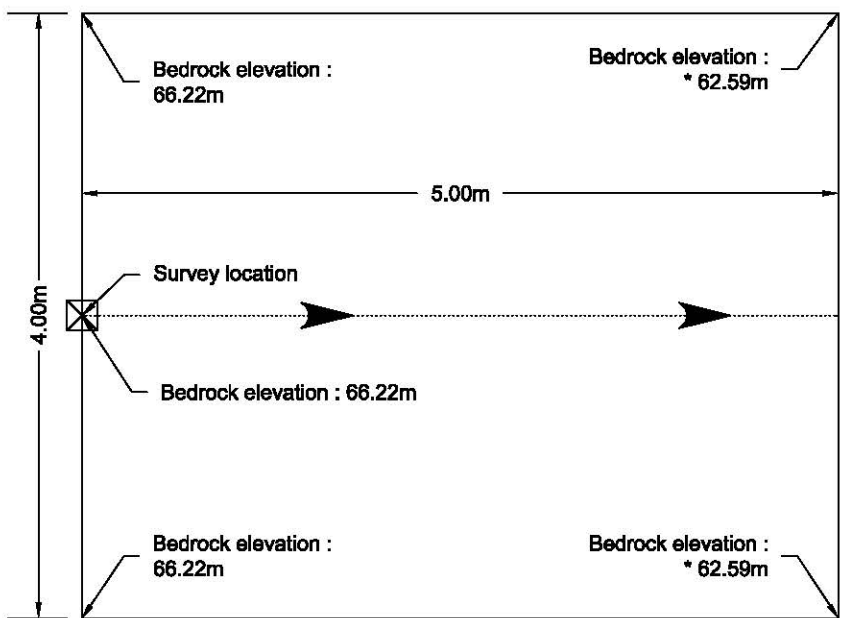
TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 5.0m



TP-15-05



Side A : West wall



Side B : East wall

Legend

→ : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.



SCALE: 1:50

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-05



Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-06
DATE : 2015-09-29
COORDINATES : UTM 19 NAD83
E : 555438.48 **N** : 5452405.86

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
	69.62	Brown sand, some silt. Presence of organic matter.	MA-1	X			
0.50	69.12	Light brown silty clay becoming grey at 1.25 m, traces to some sand. Presence of organics from 0.50 to 1.00 m.	MA-2	X			
			MA-3	X			
			MA-4	X			
1.75	67.87	Bottom of test pit. Refusal on bedrock.					

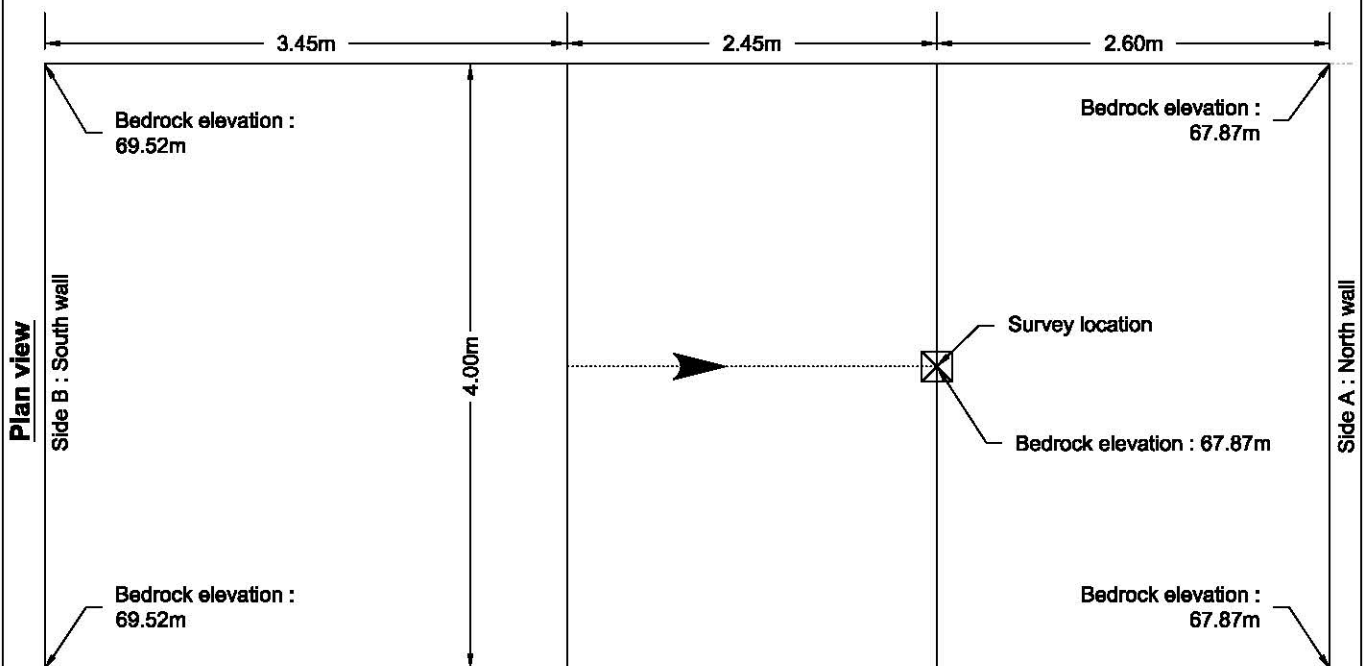
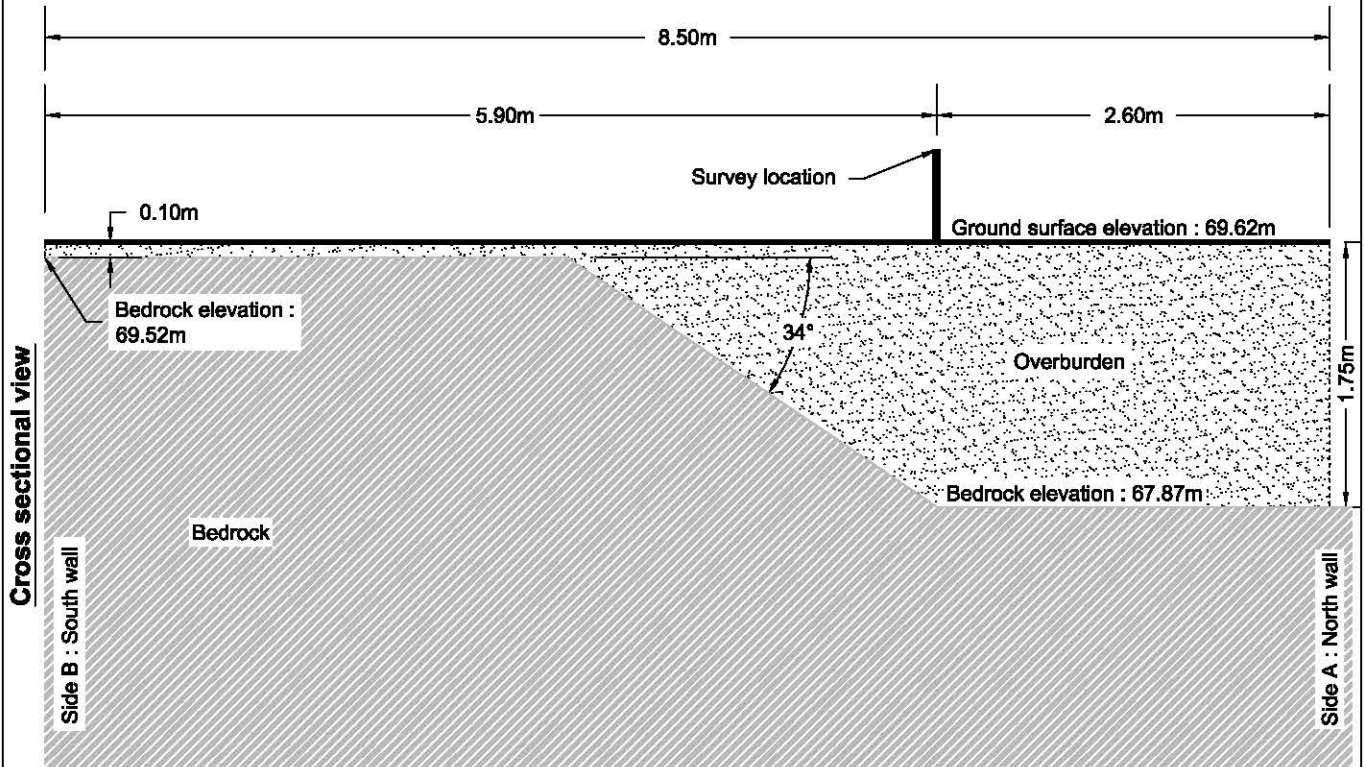
COMMENTS:
 Step-like bedrock dipping approximately 34° in the South direction. See the following drawing for further details. Seepage from 1.50 to 1.75 m on the West wall of the trench.



EQUIPMENT : Komatsu PC138
TEST PIT DIMENSIONS AT GROUND SURFACE : 1.8m x 8.5m



TP-15-06



SCALE: 1:50

Legend

-----> : dip direction

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-06



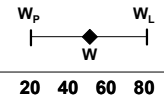
Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-07
DATE : 2015-09-29
COORDINATES : UTM 19 NAD83
E : 555478.31 **N** : 5452386.64

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
							
0.25	69.97	Black topsoil and peat (Von Post: H1).	MA-1	X			
		Bottom of test pit. Refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:
 Bedrock is sub-horizontal.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 1.0m x 2.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-07



Side A : West Wall



Side B : East Wall

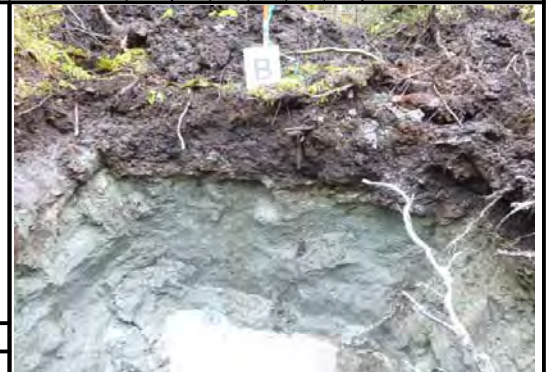
CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-08
DATE : 2015-09-29
COORDINATES : UTM 19 NAD83
E : 555501.82 **N** : 5452401.28

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
0.50	69.27	Dark brown peat layer, very slightly decomposed (Von Post: H3).	MA-1	X		
1.00	68.77	Grey sand and silt, traces of gravel (SC). Presence of seashells.	MA-2	X		
1.50			MA-3	X	16 36 32 27	G
2.00			MA-4	X		
2.50	66.77	Grey silty clay of low plasticity (CL), traces of sand. Presence of seashells.	MA-5	X		
3.00	66.27	Bottom of test pit. Refusal on bedrock.	MA-6	X	17 29 39	

COMMENTS:

Seepage from 1.50 to 3.00 m on the West wall of the trench.


EQUIPMENT : Komatsu PC138

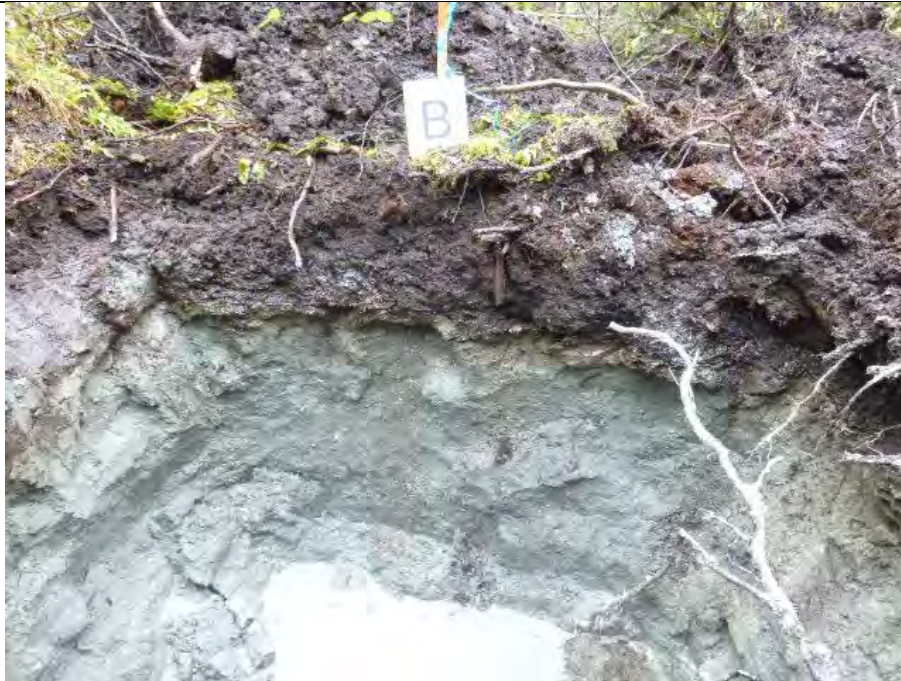
TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-08



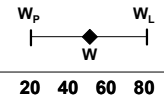
Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-09
DATE : 2015-10-05
COORDINATES : UTM 19 NAD83
E : 555483.39 **N** : 5452475.93

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
0.30	73.29	Sandy organic matter. Presence of cobbles (2%) and boulders (3%, max. diameter: 0.7 m). The boulders apparently fell from a nearby outcrop. Bottom of the test pit. Refusal on bedrock.	MA-1	X			
1							
2							
3							
4							

COMMENTS:

Bedrock dipping 11° in the North direction. See the following drawing for further details. Ground surface dipping in the same direction.

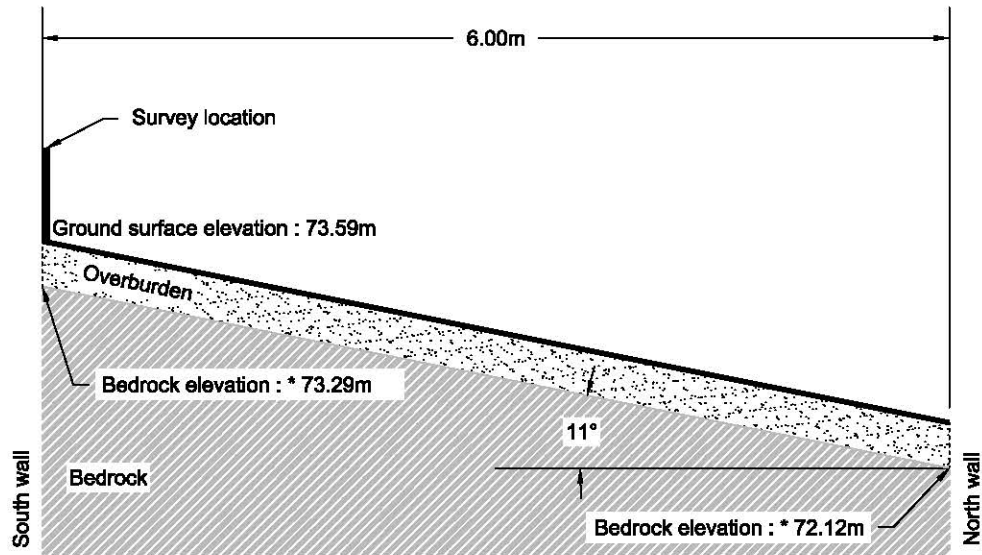

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.5m x 6.0m

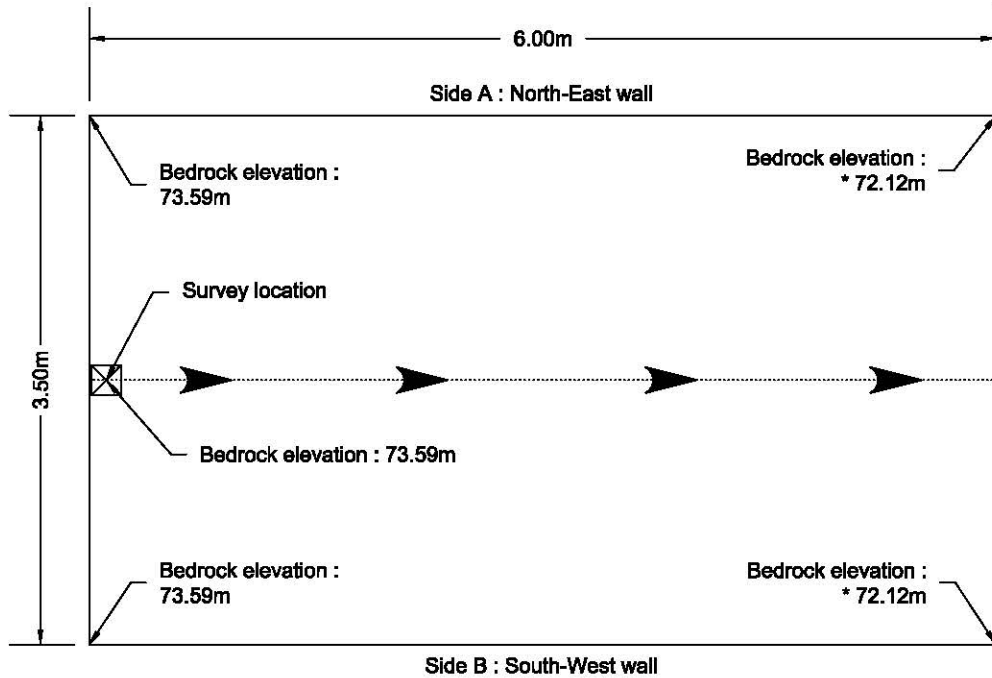
TP-15-09



Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-09



Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-10
DATE : 2015-09-29
COORDINATES : UTM 19 NAD83
E : 555410.53 **N** : 5452378.35

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%) W_p — W — W_L 20 40 60 80	OTHER TESTS
0.25	71.18	Brown top soil and organics, some sand.	MA-1	X		
		Bottom of test pit. Refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:
 Bedrock is sub-horizontal.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 1.0m x 2.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-10



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-11
DATE : 2015-10-01
COORDINATES : UTM 19 NAD83
E : 555538.78 **N** : 5452357.01

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W_p	W_L		W
			20	40	60	80		
	69.71	Dark brown peat layer, very slightly decomposed (Von Post: H3).	MA-1	X				
1.00	68.71	Brown sand, some silt. Presence of a small amount of seashells.	MA-2	X				
1.25	68.46	Grey silty clay, traces of sand. Presence of a small amount of seashells.	MA-3	X				
			MA-4	X				
			MA-5	X				
2.75	66.96	Assumed grey clay. Unstable trench walls make it impossible to sample the soil.	MA-6	X				

COMMENTS:

Visible seepage at 1.25 m coming from the East wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-11
DATE : 2015-10-01
COORDINATES : UTM 19 NAD83
E : 555538.78 **N** : 5452357.01

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
			20	40	60	80	
		Bottom of test pit. Refusal on assumed bedrock.					
5							
6							
7							
8							

COMMENTS:

Visible seepage at 1.25 m coming from the East wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-11



Side A : North-West Wall



Side B : South-East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-12
DATE : 2015-10-05
COORDINATES : UTM 19 NAD83
E : 555498.08 **N** : 5452523.59

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%) W_p — W — W_L 20 40 60 80	OTHER TESTS
0.30	74.04	Sandy organic matter.	MA-1	X		
		Bottom of test pit. Refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:

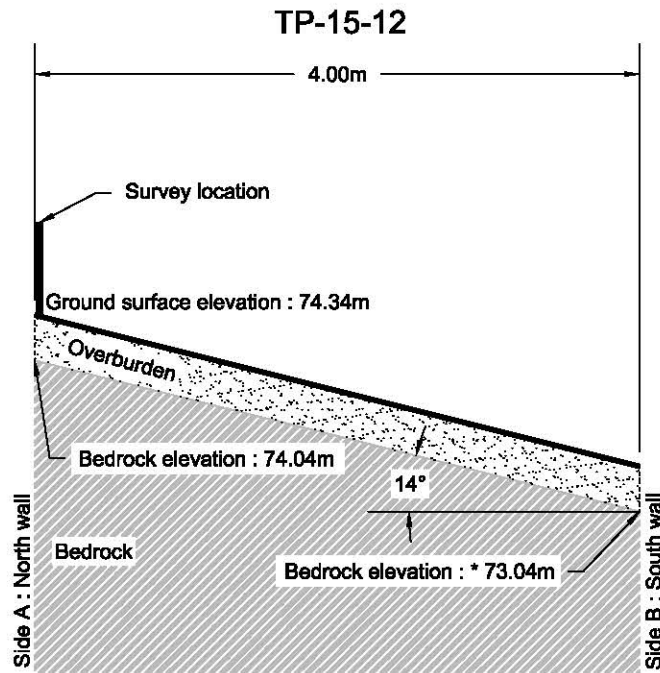
Bedrock dipping 14° in the South direction. See the following drawing for further details. Ground surface dipping in the same direction.


EQUIPMENT : Komatsu PC138

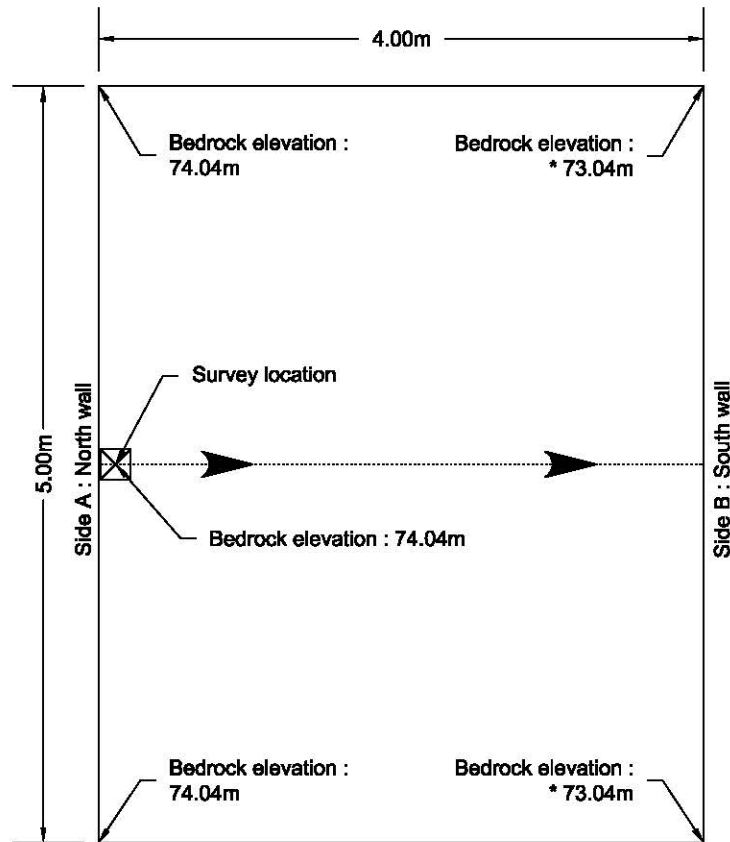
TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 5.0m



Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-12



Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-13
DATE : 2015-10-05
COORDINATES : UTM 19 NAD83
E : 555522.59 **N** : 5452463.38

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
0.20	72.79	Sandy organic matter. Bottom of test pit. Refusal on bedrock.	MA-1	X		

COMMENTS:

Bedrock is sub-horizontal (~2° dip in the East direction). Ground surface dipping in the same direction.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-13



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-14
DATE : 2015-10-07
COORDINATES : UTM 19 NAD83
E : 555546.36 **N** : 5452501.63

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%) $\begin{array}{c} W_p \quad \leftarrow \quad \blacklozenge \quad \rightarrow \quad W_L \\ \quad \quad \quad \\ \hline 20 \quad 40 \quad 60 \quad 80 \\ \quad \quad \quad W \end{array}$	OTHER TESTS
0.40	71.87	Sandy organic matter. Presence of boulders that detached from the outcrop.	MA-1	X		
	71.47	Bottom of test pit. Refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:

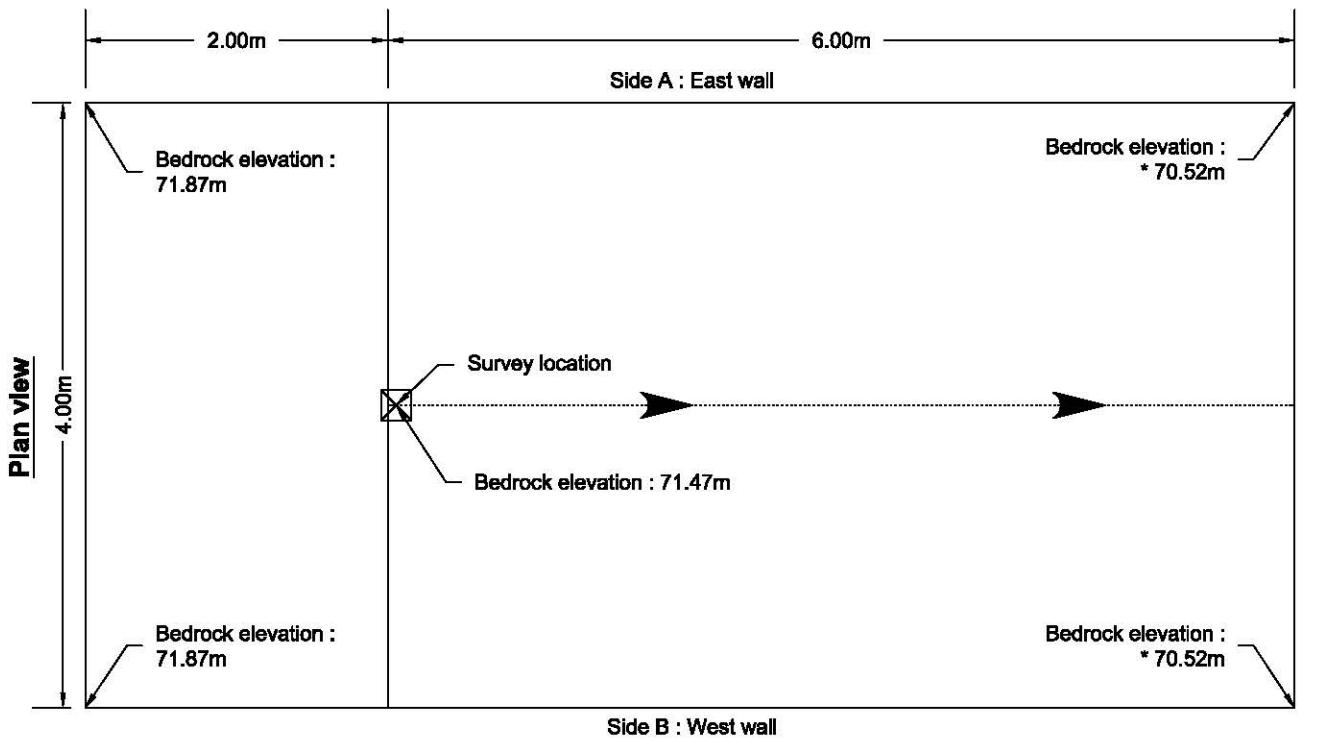
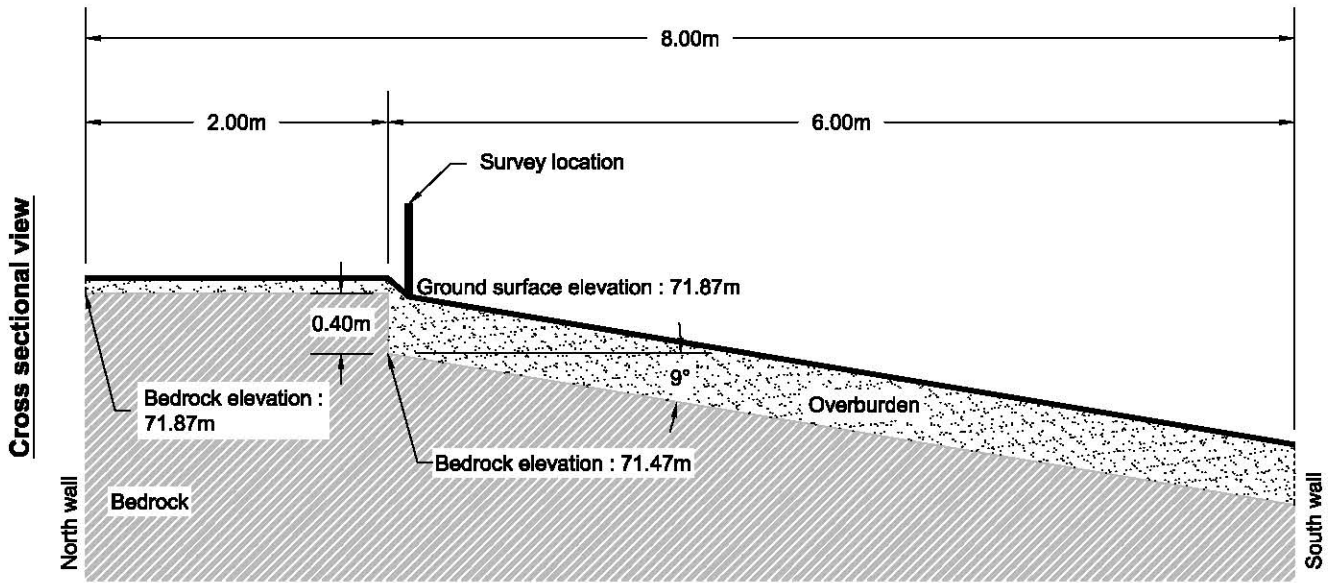
Step-like bedrock dipping approximately 10° in the South direction. Ground surface dipping in the same direction. See the following drawing for further details.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 8.0m



TP-15-14



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-14



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-15
DATE : 2015-10-01
COORDINATES : UTM 19 NAD83
E : 555079.85 **N** : 5452385.12

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
			20	40	60	80		
0.10	69.23	Dark brown peat layer, completely undecomposed (Von Post: H1).	MA-1	X				
	69.13	Grey sand, some silt.	MA-2	X				
0.40	68.83	Indurated dark brown sand (hardpan), traces of gravel.	MA-3	X				
0.80	68.43	Beige silty sand, traces of gravel.	MA-4	X				
			MA-5	X				
			MA-6	X				
2.20	67.03	Grey silty clay.	MA-7	X				
2.30	66.93	Bottom of test pit. Refusal on assumed bedrock.						

COMMENTS:
 Bedrock is sub-horizontal.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.5m x 4.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-15



Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-16
DATE : 2015-09-28
COORDINATES : UTM 19 NAD83
E : 555347.27 **N** : 5452314.81

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
			20 40 60 80			
0.20	68.82	Dark brown topsoil.	MA-1	X		
	68.62	Grey silty clay (CL) of medium plasticity, traces of sand.	MA-2	X	19 ——— 41 ----- 37	
			MA-3	X		
			MA-4	X		
			MA-5	X		
			MA-6	X	16 ——— 32 ----- 29	
2.70	66.12	Bottom of test pit. Refusal of assumed bedrock.				

COMMENTS:

Visible seepage at 1.2 m. The bedrock dip is not visible due to water accumulation in the trench. Some outcrops are visible nearby to the South. Therefore the bedrock dip is assumed to be North.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 6.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-16



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-17
DATE : 2015-10-07
COORDINATES : UTM 19 NAD83
E : 555209.06 **N** : 5452340.97

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS	
							W_p W_L ----- W
20	40	60	80				
0.30	69.70	Sandy organic matter.	MA-1	X			
		Brown sand, some silt, traces of gravel. Presence of cobbles (<1%).	MA-2	X	22		G
			MA-3	X			
1.30	68.70	Grey silty sand, some clay, traces of gravel (SC).	MA-4	X			
			MA-5	X			
			MA-6	X			
		Presence of seashells from 2.80 to 3.30 m.	MA-7	X	122 21		S
3.30	66.70	Bottom of test pit. Refusal on bedrock.					

COMMENTS:

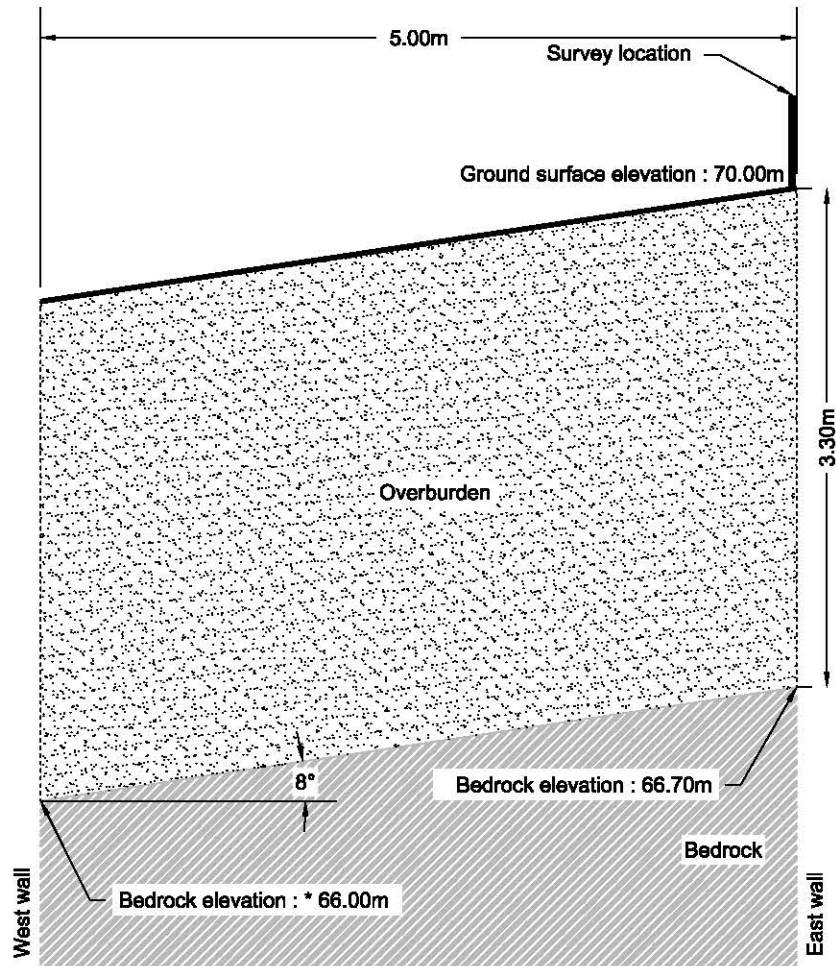
Bedrock dipping approximably 8° in the West direction. See the following drawing for further details. Visible seepage of depth at 1.2 m from the West wall of the trench.


EQUIPMENT : Komatsu PC138

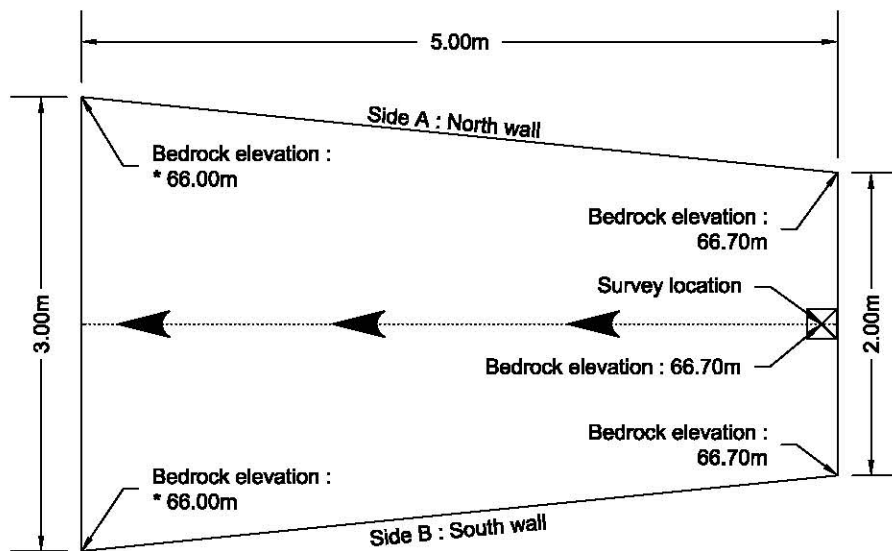
TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m

TP-15-17

Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

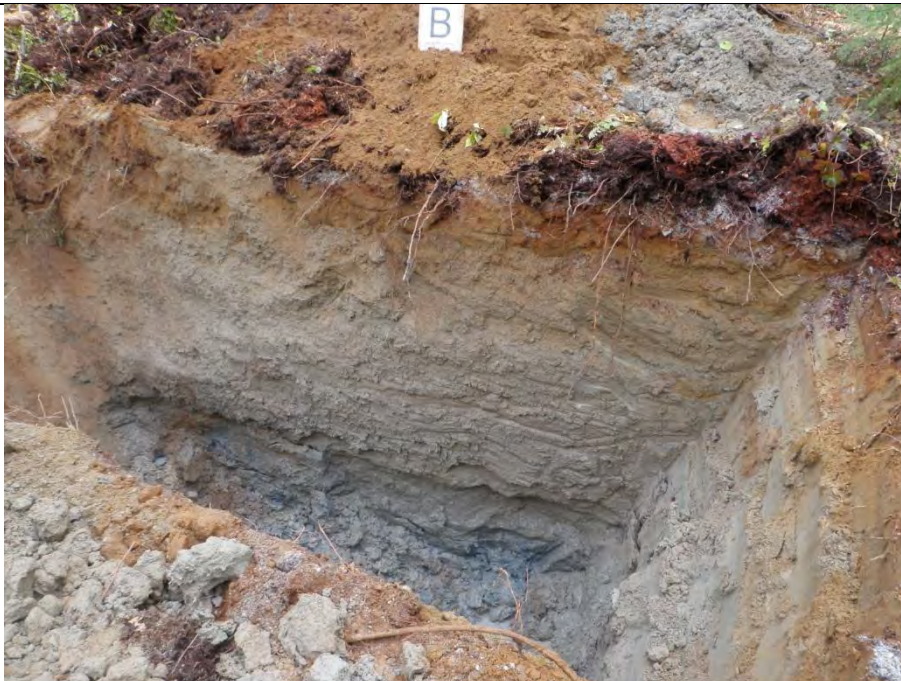
Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-17



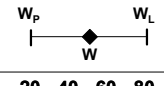
Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-18
DATE : 2015-10-07
COORDINATES : UTM 19 NAD83
E : 555310.92 **N** : 5452352.03

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
	69.65	Sandy organic matter.					
0.30	69.35	Brown sand, some silt, traces of gravel.	MA-1				
			MA-2		25		
			MA-3				
1.30	68.35	Grey silty clay, traces of sand.	MA-4				
			MA-5				
2.25 2.30	67.40 67.35	Assumed thin layer of sand overlying the bedrock. Presence of bedrock fragments. Bottom of test pit. Refusal on bedrock.					

COMMENTS:

Bedrock dipping 11° in the North-West direction. See the following drawing for further details.
 Visible seepage of depth at 1.2 m from the East wall of the trench.

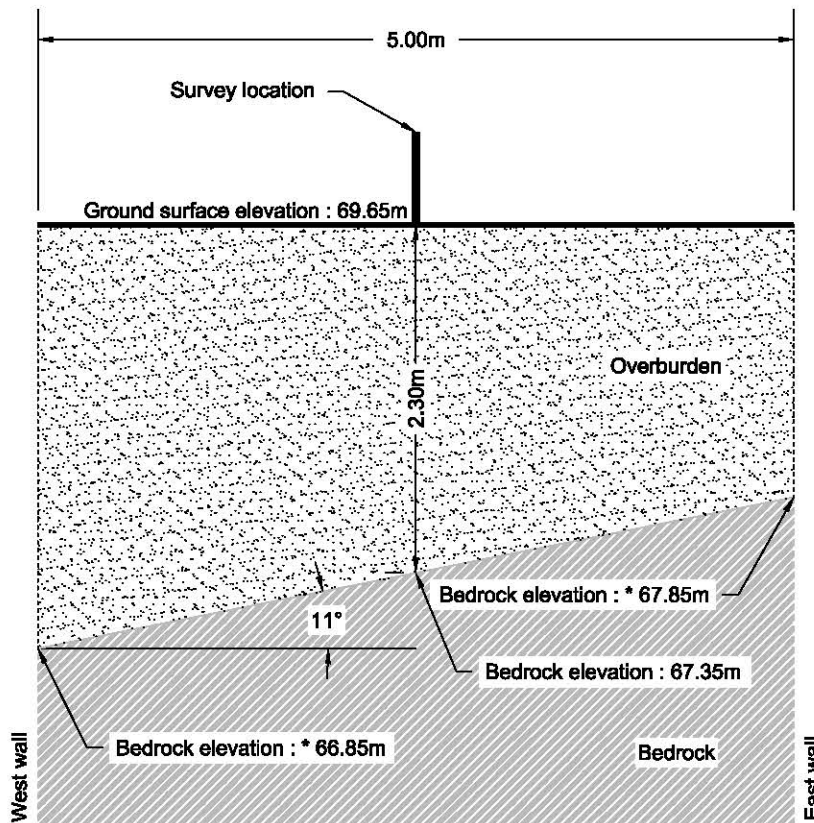

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m

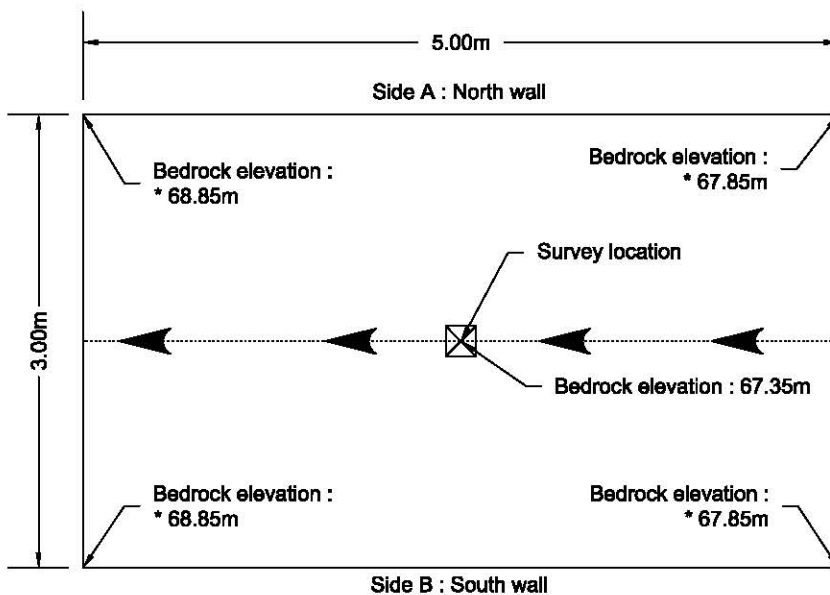
TP-15-18



Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

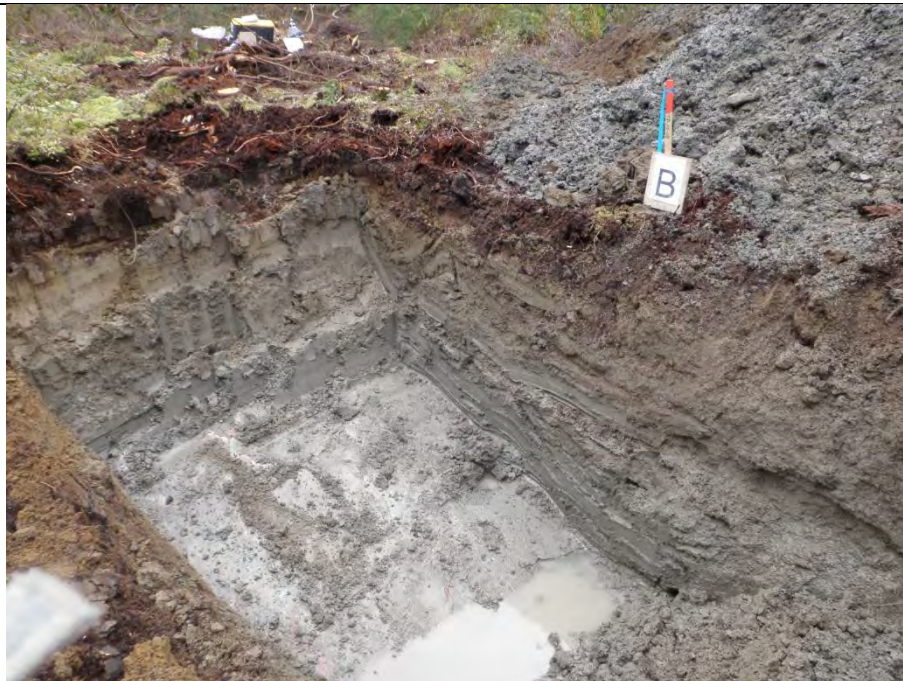
Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-18



Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-19
DATE : 2015-09-28
COORDINATES : UTM 19 NAD83
E : 555395.77 **N** : 5452316.90

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
			20	40	60	80	
	69.73	Sandy organic matter.	MA-1	X			
0.20	69.53	Brown sand, some silt.	MA-2	X			
			MA-3	X			
1.20	68.53	Grey sandy silt, traces of gravel.	MA-4	X			
1.50	68.23	Grey silty clay, some sand, traces of gravel. Presence of seashells. Presence of cobbles at 1.7 m.	MA-5	X			
			MA-6	X			
2.50	67.23	Bottom of test pit. Refusal on bedrock.					

COMMENTS:

Bedrock dipping 14° in the North-West direction. See the following drawing for further details.
 Visible seepage of depth at 0.7 m from the North wall of the trench.

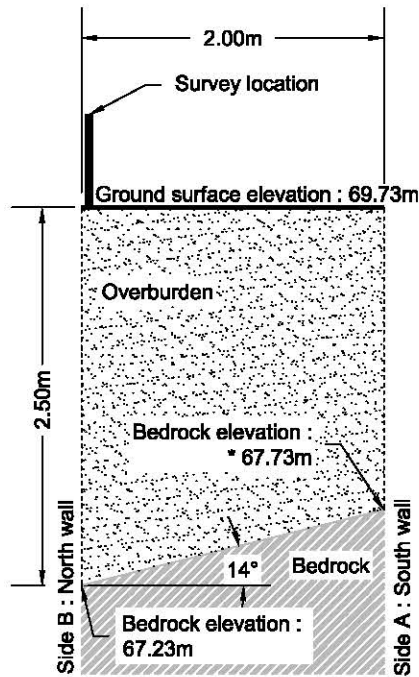

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.0m

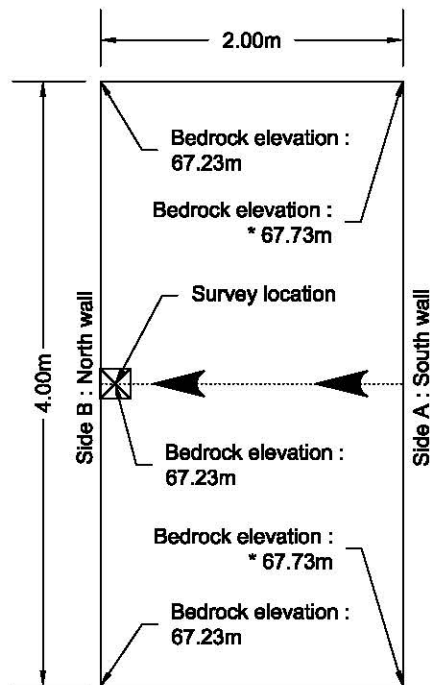


TP-15-19

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-19



Side A : South Wall



Side B : North Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-20
DATE : 2015-09-28
COORDINATES : UTM 19 NAD83
E : 555456.50 **N** : 5452308.33

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
	69.98							
0.50	69.48	Sandy organic matter.	MA-1	X				
		Beige sand, some silt.	MA-2	X				
			MA-3	X				
1.50	68.48	Grey silty clay (CL) of low plasticity, some sand*. Presence of seashells.	MA-4	X				
			MA-5	X	15/28	127		D _r = 2,774 S
			MA-6	X				
3.00	66.98	Bottom of test pit. Refusal on assumed bedrock or large boulders.						

COMMENTS:

The bedrock is assumed to be near the refusal depth. Visible seepage at 1.2 m on the South-East wall of the trench.

* The percentage of sand can be overestimated due to the presence of seashells.


EQUIPMENT : Komatsu PC138

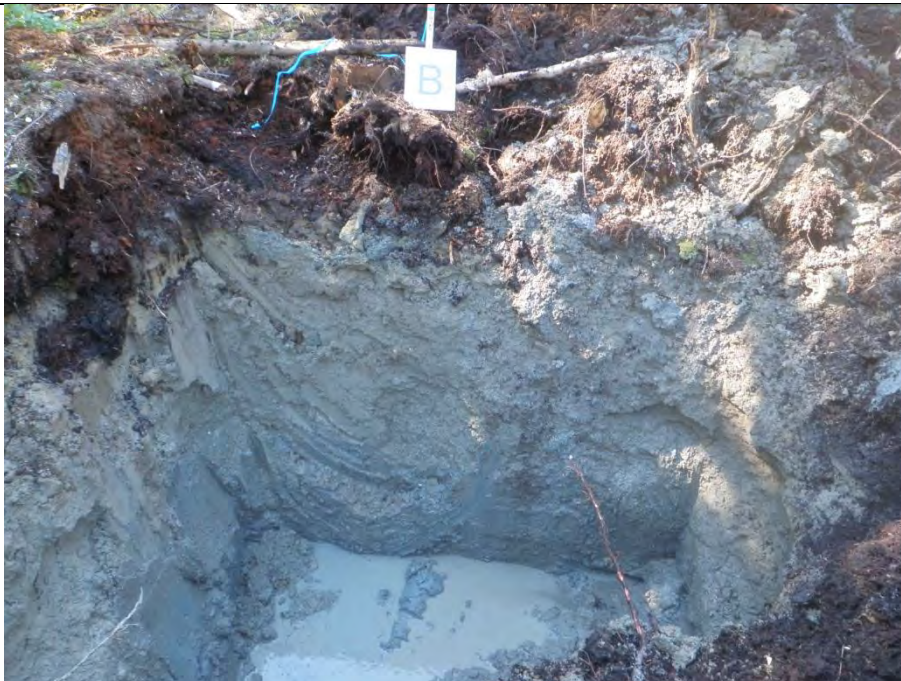
TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 4.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-20



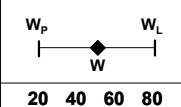
Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-21
DATE : 2015-10-01
COORDINATES : UTM 19 NAD83
E : 555125.43 **N** : 5452480.80

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
							
	66.90	Dark brown topsoil. Presence of roots.	MA-1	X			
0.30	66.60	Beige silty sand, traces of clay and gravel.	MA-2	X	18		S
			MA-3	X			
1.30	65.60	Grey silty clay (CL) of medium plasticity. Presence of seashells down to 2.30 m of depth.	MA-4	X	22		
			MA-5	X			
			MA-6	X	19-38	48	
2.80	64.10	Bottom of test pit. Refusal on assumed bedrock.					

COMMENTS:

Bedrock dipping 3° in the South direction. Visible seepage of depth at 1.5 m from the North wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.3m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-21



Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-22
DATE : 2015-10-01
COORDINATES : UTM 19 NAD83
E : 555050.97 **N** : 5452467.19

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
			20	40	60	80		
0.30	66.34	Brown sand. Presence of organic matter.	MA-1	X				
	66.04	Grey silty sand, traces of gravel. Non-plastic soil. Presence of seashells.	MA-2	X				
1			MA-3	X				
			MA-4	X				
			MA-5	X	22			N.P.
			MA-6	X				
2.10	64.24	Bottom of test pit. Refusal on assumed bedrock.						
3								
4								

COMMENTS:

Visible seepage at 1.9 m on the North-West wall of the trench.
 N.P.: Atterberg limits were determined for the soil, yielding a non-plastic result.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-22



Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-23
DATE : 2015-10-07
COORDINATES : UTM 19 NAD83
E : 555246.67 **N** : 5452378.08

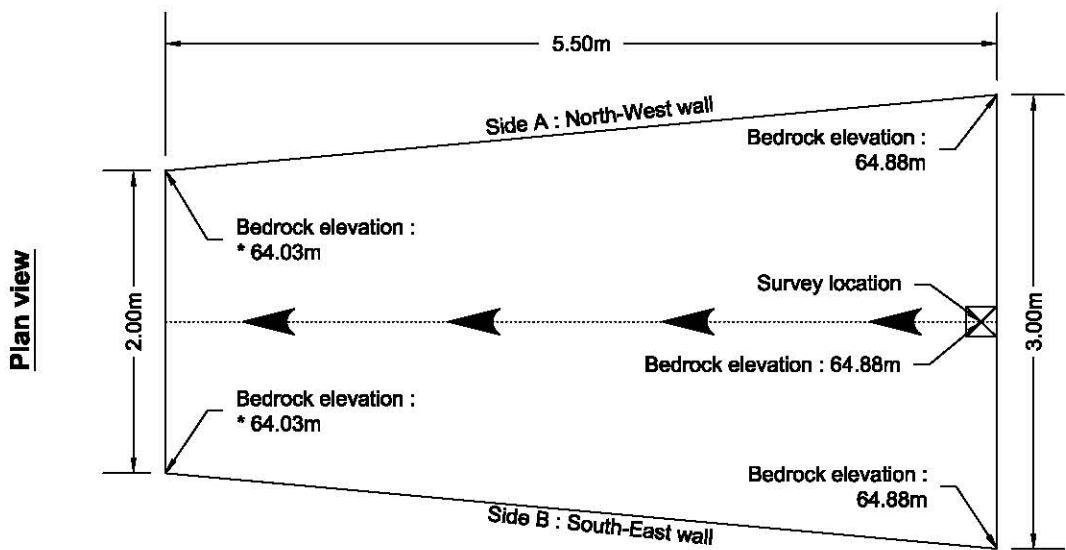
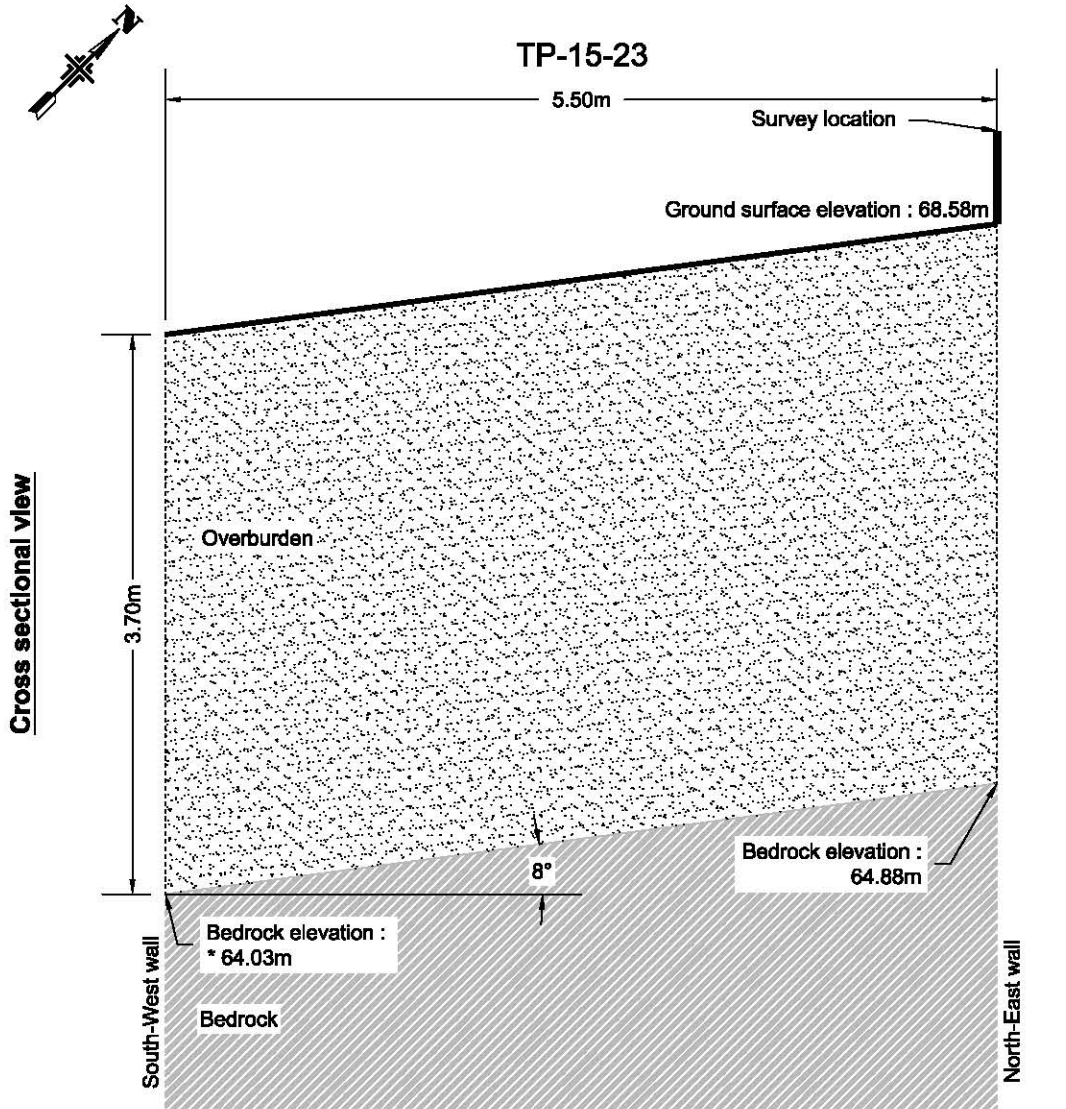
DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
20	40	60	80			
	68.58	Sandy organic matter.	MA-1	X		
0.30	68.28	Brown sand, some silt.	MA-2	X		
0.80	67.78	Grey silty clay (CL) of medium plasticity, traces of sand.	MA-3	X		
			MA-4	X	17 - 35 33	
			MA-5	X		
			MA-6	X		
		Presence of seashells in a small quantity from 2.8 m down to refusal depth.	MA-7	X		
			MA-8	X	19 44 56	
3.70	64.88	Bottom of test pit. Refusal on bedrock.				

COMMENTS:

Bedrock dipping 8° in the South-West direction. See the following drawing for further details.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.5m



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-23



Side A : North-West Wall



Side B : South-East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-24
DATE : 2015-09-30
COORDINATES : UTM 19 NAD83
E : 555420.68 **N** : 5452448.07

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS				
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%) $\begin{array}{c} W_p \quad \quad W_L \\ \quad \quad \\ \text{---} \quad \quad \text{---} \\ \quad \quad \quad W \end{array}$	OTHER TESTS			
0.15	69.88	Sandy organic matter.	MA-1	X	20	40	60	80	
		Bottom of test pit. Refusal on bedrock.							
1									
2									
3									
4									

COMMENTS:

Outcrop next to TP-15-24. Surrounding area is generally sub-horizontal. The bedrock is assumed to be also sub-horizontal.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 6.1m x 10.1m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-24



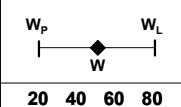
Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-25
DATE : 2015-09-30
COORDINATES : UTM 19 NAD83
E : 555451.77 **N** : 5452426.39

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
	68.92	Peat (Von Post: H4). Presence of cobbles (5%).	MA-1	X			
0.50	68.42	Silt and sand*, traces of gravel. Presence of seashells, of cobbles (5%) and boulders (5%, max. diameter: 0.35 m).	MA-2	X	◆ 23		G
1.00	67.92	Grey silty clay. Presence of seashells.	MA-3	X			
			MA-4	X			
2.00	66.92	Bottom of the pit. Refusal on bedrock.					

COMMENTS:

Water level in the trench at 0.3 m from the ground surface.
 * The percentage of sand can be overestimated due to the presence of seashells.

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m


CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-25



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-26
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555403.63 **N** : 5452516.10

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	68.67	Sandy organic matter.	MA-1	X		
0.30	68.37	Silty sand, some clay and traces of gravel (SC). Presence of seashells from 1.30 to 1.80 m.	MA-2	X	21	G
			MA-3	X		
			MA-4	X	18 — 46 37	S
1.80	66.87	Grey silty clay, traces of sand. Presence of seashells.	MA-5	X		
			MA-6	X		
			MA-7	X		
3.50	65.17	Bottom of test pit. Refusal on bedrock.	MA-8	X	19 — 37 39	

COMMENTS:

Bedrock is sub-horizontal. Visible seepage of depth at 1.3 m from the East wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-26



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-27
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555419.52 **N** : 5452499.92

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
			20	40	60	80	
	69.11	Sandy organic matter.	MA-1	X			
0.30	68.81	Grey silty sand, traces of gravel.	MA-2	X			
			MA-3	X			
1.30	67.81	Grey silty clay, traces of gravel and sand. Presence of seashells.	MA-4	X			
			MA-5	X			
			MA-6	X			
2.80	66.31	Bottom of the pit. Refusal on bedrock.					

COMMENTS:

Bedrock is subhorizontal. Seepage at 1.3 m.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 6.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-27



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-28
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555428.28 **N** : 5452523.74

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
	70.12							
0.30	69.82	Sandy organic matter.	MA-1	X				
		Brown sand, some silt, traces of gravel. Presence of cobbles (2%) and boulders (1%, max. diameter: 0.40 m).	MA-2	X	22			G
0.80	69.32	Grey silty sand, traces of gravel.	MA-3	X				
			MA-4	X				
1.50	68.62	Bottom of the pit. Refusal on bedrock.						

COMMENTS:

Step-like bedrock dipping 2° in the South-West direction. See the following drawing for further details. The percentage of cobbles and/or boulders were estimated after a visual description.

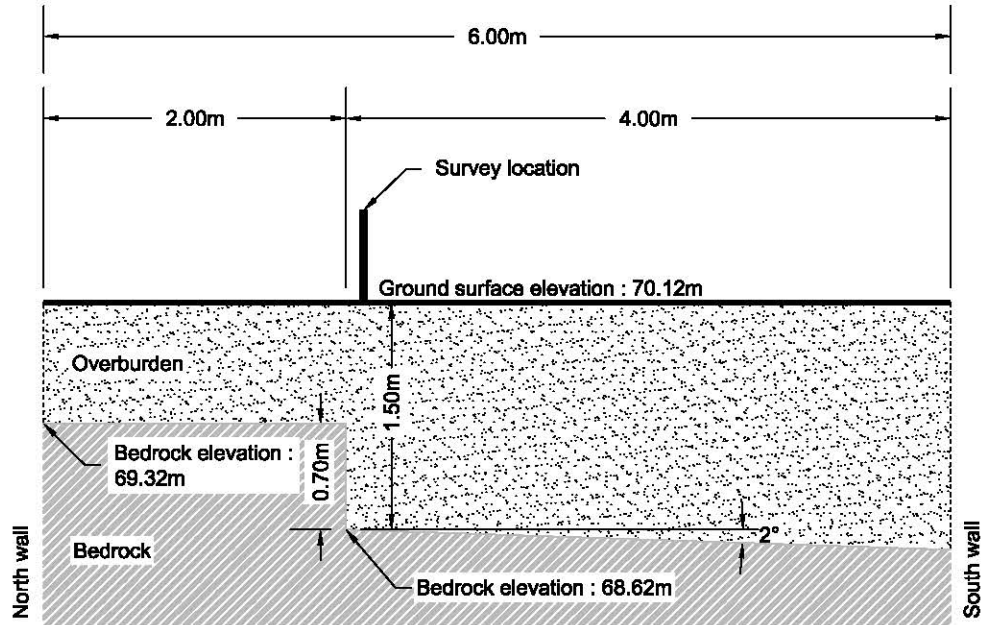

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

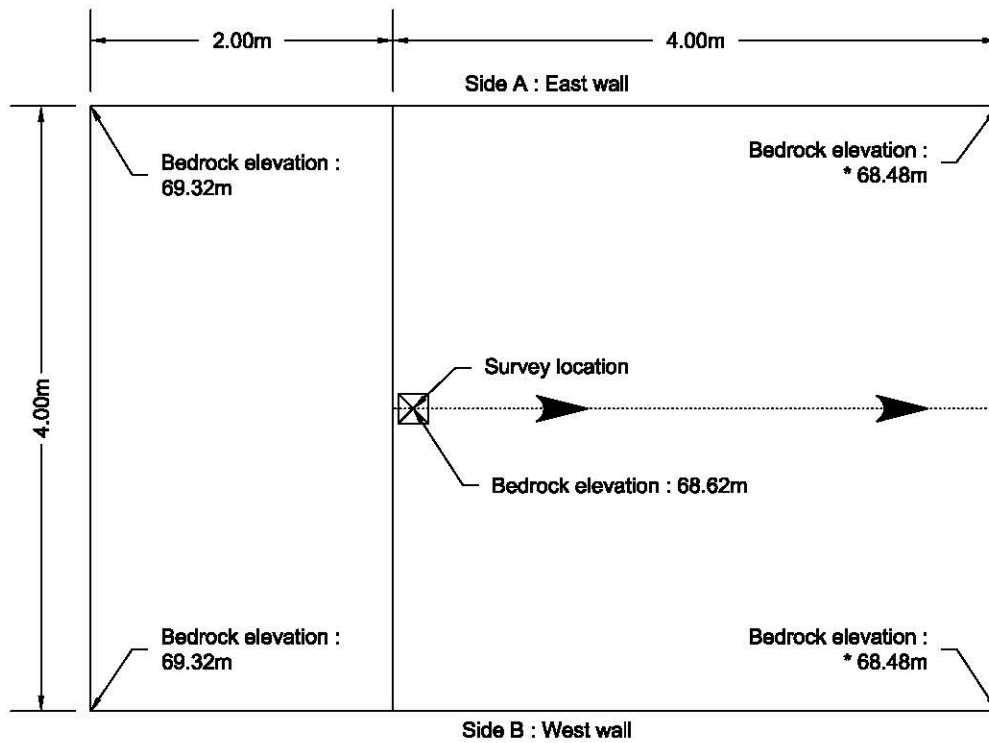


TP-15-28

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-28



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-29
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555401.52 **N** : 5452550.41

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
			20	40	60	80		
	69.30	Sandy organic matter.	MA-1	X				
0.40	68.90	Brown sand, some silt, traces of gravel.	MA-2	X				
			MA-3	X				
			MA-4	X				
1.80	67.50	Bottom of the pit. Refusal on bedrock.						

COMMENTS:

Bedrock dipping 2° in the South direction.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 7.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-29



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-30
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555302.60 **N** : 5452533.40

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
			20	40	60	80		
	67.85	Silty organic matter. Presence of roots.	MA-1	X				
			MA-2	X				
1	0.90 66.95	Grey silty clay, traces of sand. Presence of seashells in a small quantity.	MA-3	X				
			MA-4	X				
2			MA-5	X				
	2.40 65.45	Sandy silt, traces of gravel. Presence of seashells.	MA-6	X				
			MA-7	X				
			MA-8	X				
3								
4								

COMMENTS:
 Visible seepage at 1.0 m.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-30
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555302.60 **N** : 5452533.40

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS				
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS		
					W _p	W _L		W	
			20	40	60	80			
4.40	63.45	Bottom of test pit. Reached the limit of the equipment.	MA-9	X					

COMMENTS:
 Visible seepage at 1.0 m.



EQUIPMENT : Komatsu PC138
TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

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CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-30



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-31
DATE : 2015-09-28
COORDINATES : UTM 19 NAD83
E : 555509.26 **N** : 5452300.81

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%) W_p W_L ----- W	OTHER TESTS
	70.13					
0.40	69.73	Sandy organic matter.	MA-1	X		
		Brown sand, traces of gravel and silt. Presence of organics.	MA-2	X		
0.90	69.23	Grey sand, some clay, some silt, traces of gravel. Presence of seashells.	MA-3	X	27	$D_r = 2,706$ S
1.40	68.73	Silty clay of high plasticity (CH), some sand*, traces of gravel. Presence of seashells.	MA-4	X	22 51 ----- 50	G
1.90	68.23	Bottom of test pit. Water infiltrating from pit bottom.				

COMMENTS:
 * The percentage of sand can be overestimated due to the presence of seashells.



EQUIPMENT : Komatsu PC138
TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 3.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-31



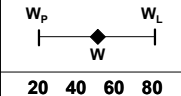
Side A : South-West Wall



Side B : North-East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-32
DATE : 2015-09-28
COORDINATES : UTM 19 NAD83
E : 555425.67 **N** : 5452350.63

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W_p	W_L	
							
	70.07						
0.20	69.87	Moss and organic matter.	MA-1	X			
		Beige silty sand, traces of gravel. Presence of cobbles from 1.20 to 1.50 m.	MA-2	X			
			MA-3	X	26		G
			MA-4	X			
1.50	68.57	Bottom of test pit. Refusal on bedrock.					

COMMENTS:

Outcrop approximately 7 m to the North-East of the test pit. Visible seepage at 0.8 m from the South-East wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-32



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-33
DATE : 2015-10-05
COORDINATES : UTM 19 NAD83
E : 555475.37 **N** : 5452443.91

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
	70.36							
0.20	70.16	Sandy organic matter.	MA-1	X				
		Bottom of test pit. Refusal on bedrock.						
1								
2								
3								
4								

COMMENTS:
 Bedrock dipping 11° in the South-West direction. See the following drawing for further details.



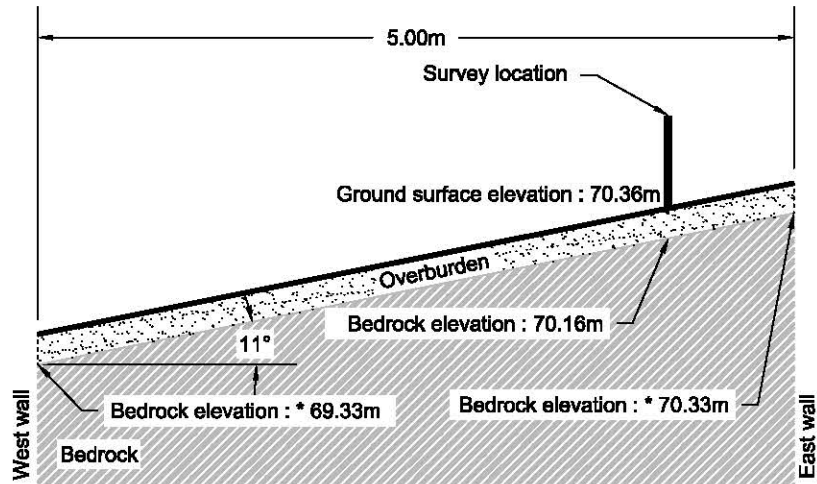
EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 5.0m

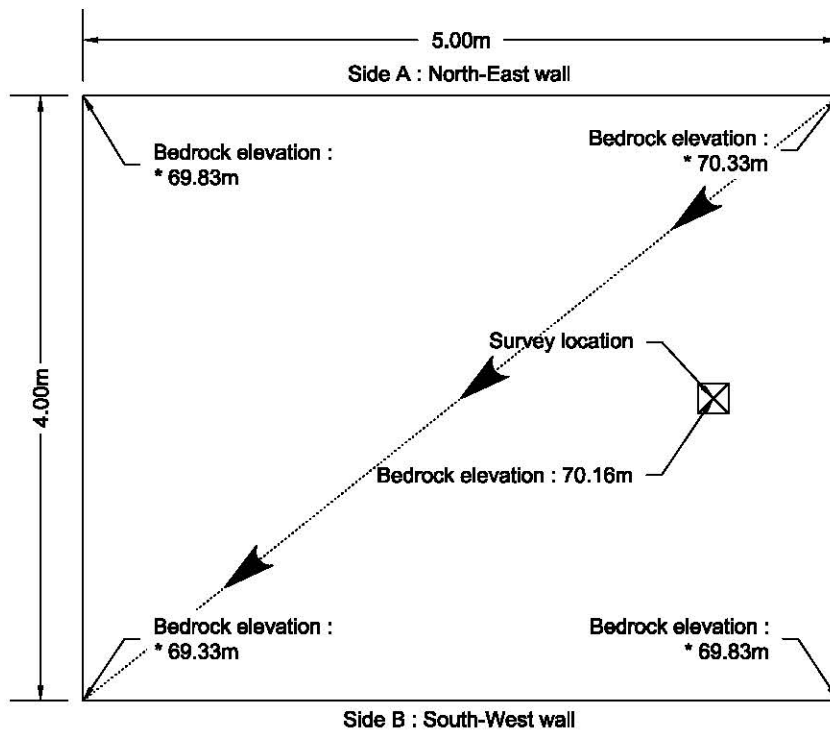
TP-15-33



Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-33



Side A : North-East Wall



Side B : South-West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-34
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555453.59 **N** : 5452513.87

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
	70.48							
0.30	70.18	Sandy organic matter.	MA-1	X				
		Grey silty sand, traces of gravel. Presence of cobbles (2%) and boulders (<1%, max. diameter: 0.4 m).	MA-2	X				
			MA-3	X				
1.30	69.18	Bottom of test pit. Refusal on bedrock.						

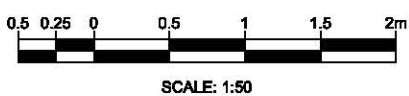
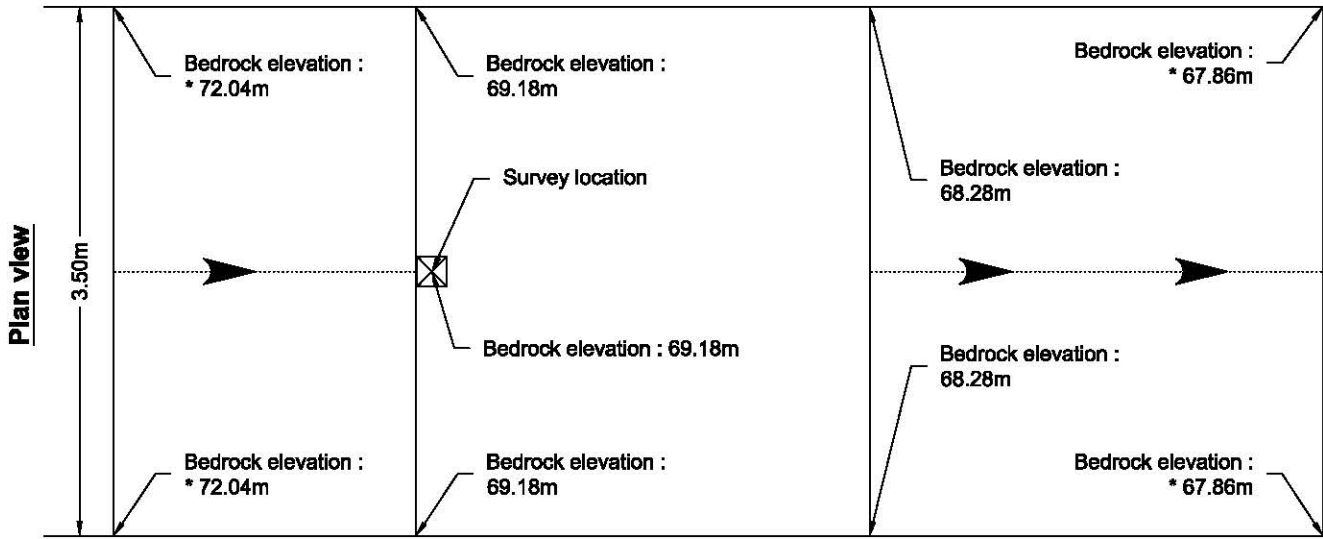
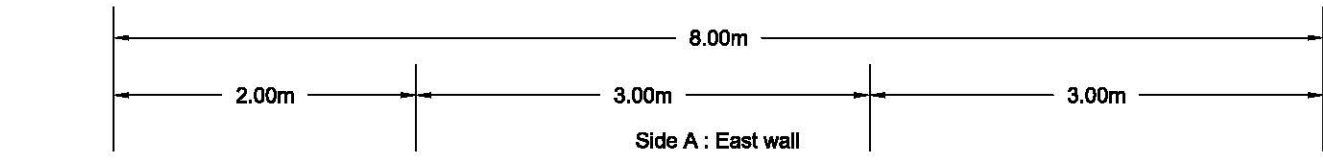
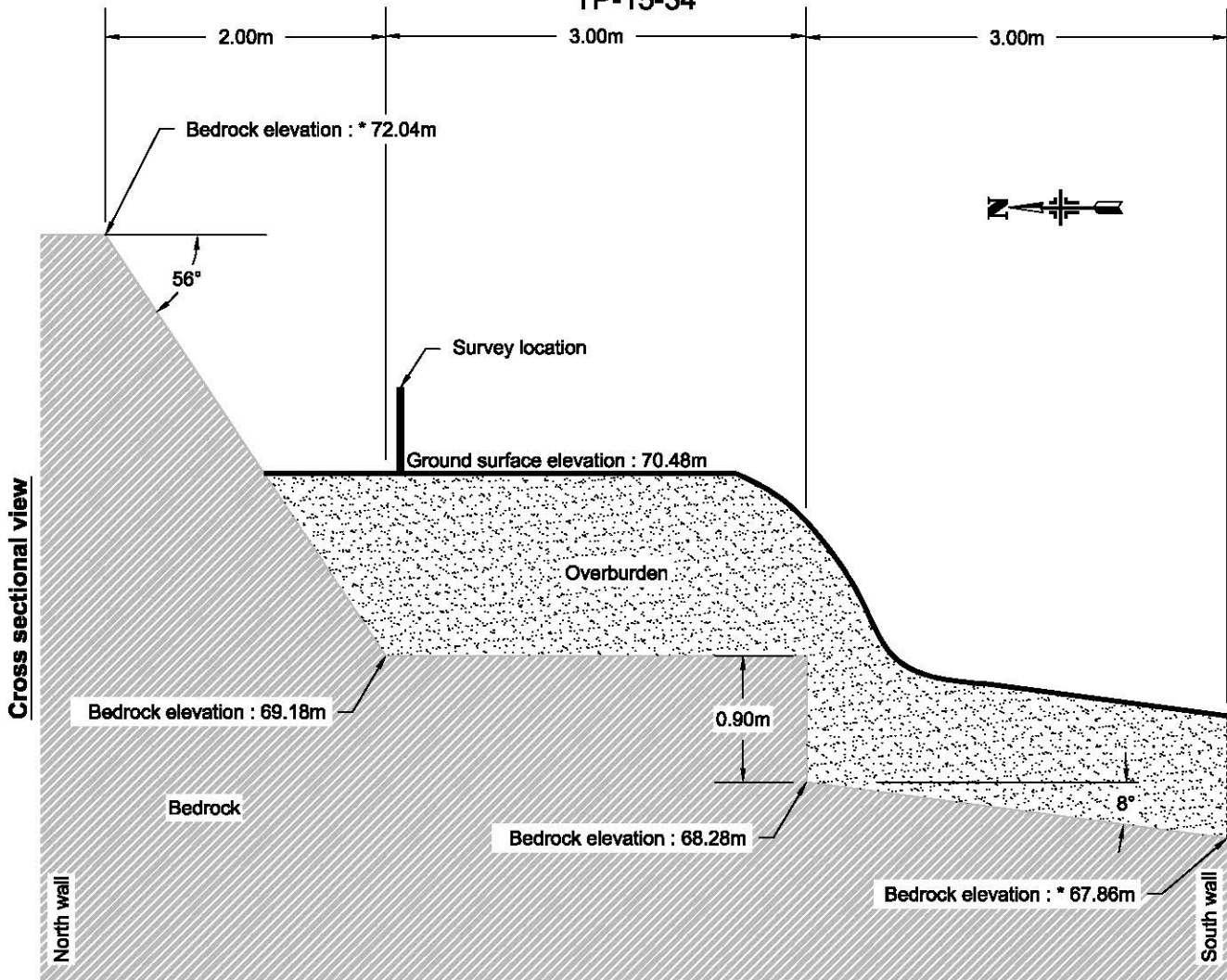
COMMENTS:
 Step-like bedrock dip the South direction. See the following drawing for further details.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.5m x 8.0m

TP-15-34



Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-34



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-35
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555347.68 **N** : 5452530.46

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
	67.96	Sandy organic matter. Presence of roots and topsoil.	MA-1	X			
			MA-2	X			
1	0.90 67.06	Grey silty sand to sandy silt, traces of gravel. Presence of a large quantity of seashells.	MA-3	X			
			MA-4	X			
2			MA-5	X			
			MA-6	X			
3	2.90 65.06	Grey silty clay, traces of sand.	MA-7	X			
			MA-8	X			

COMMENTS:
EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : m x m


CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-35
DATE : 2015-10-06
COORDINATES : UTM 19 NAD83
E : 555347.68 **N** : 5452530.46

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
4.40	63.56	Bottom of test pit. Reached the limit of the equipment.	MA-9	X		
5						
6						
7						
8						

COMMENTS:

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EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : m x m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-35



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-36
DATE : 2015-10-01
COORDINATES : UTM 19 NAD83
E : 555212.79 **N** : 5452484.08

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
	67.43	Peat (Von Post: H2).	MA-1	X			
0.30	67.13	Beige sand, some silt.	MA-2	X			
0.80	66.63	Beige silty sand.	MA-3	X			
1.20	66.23	Grey silty clay, traces of sand. Presence of seashells.	MA-4	X			
			MA-5	X			
			MA-6	X			
			MA-7	X			
			MA-8	X			

COMMENTS:

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EQUIPMENT : Komatsu PC138

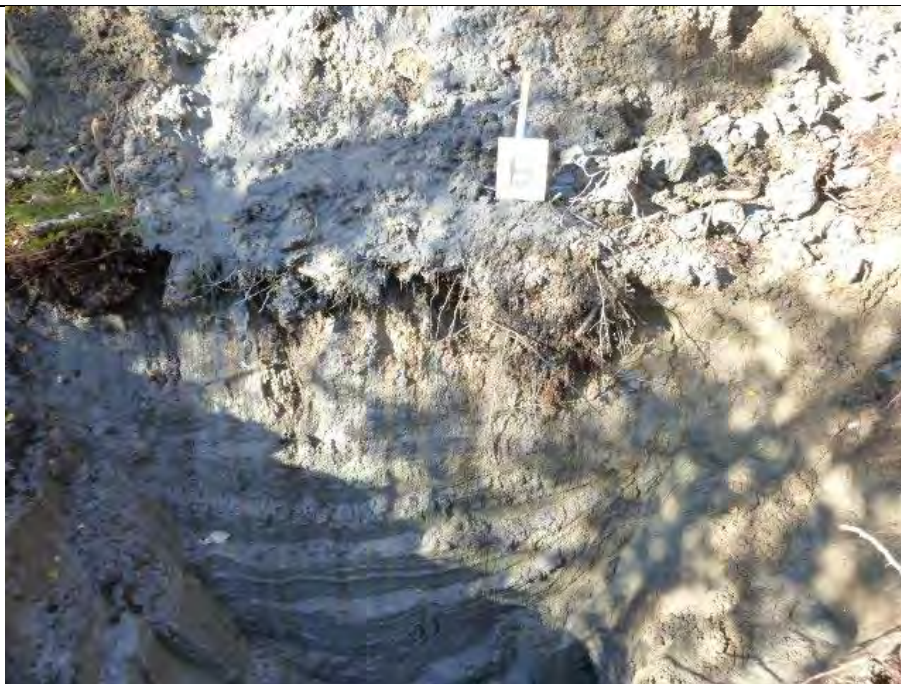
TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 6.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-36



Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP-15-39
DATE : 2015-10-07
COORDINATES : UTM 19 NAD83
E : 555345.96 **N** : 5452383.06

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS			
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	
					W _p	W _L		W
	70.49							
0.25	70.24	Sandy organic matter.	MA-1	X				
		Bottom of test pit. Refusal on bedrock.						
1								
2								
3								
4								

COMMENTS:

Bedrock dipping approximately 4° in the South direction.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

CLIENT: Mason Graphite Inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

TP-15-39



Side A : East Wall



Side B : West Wall

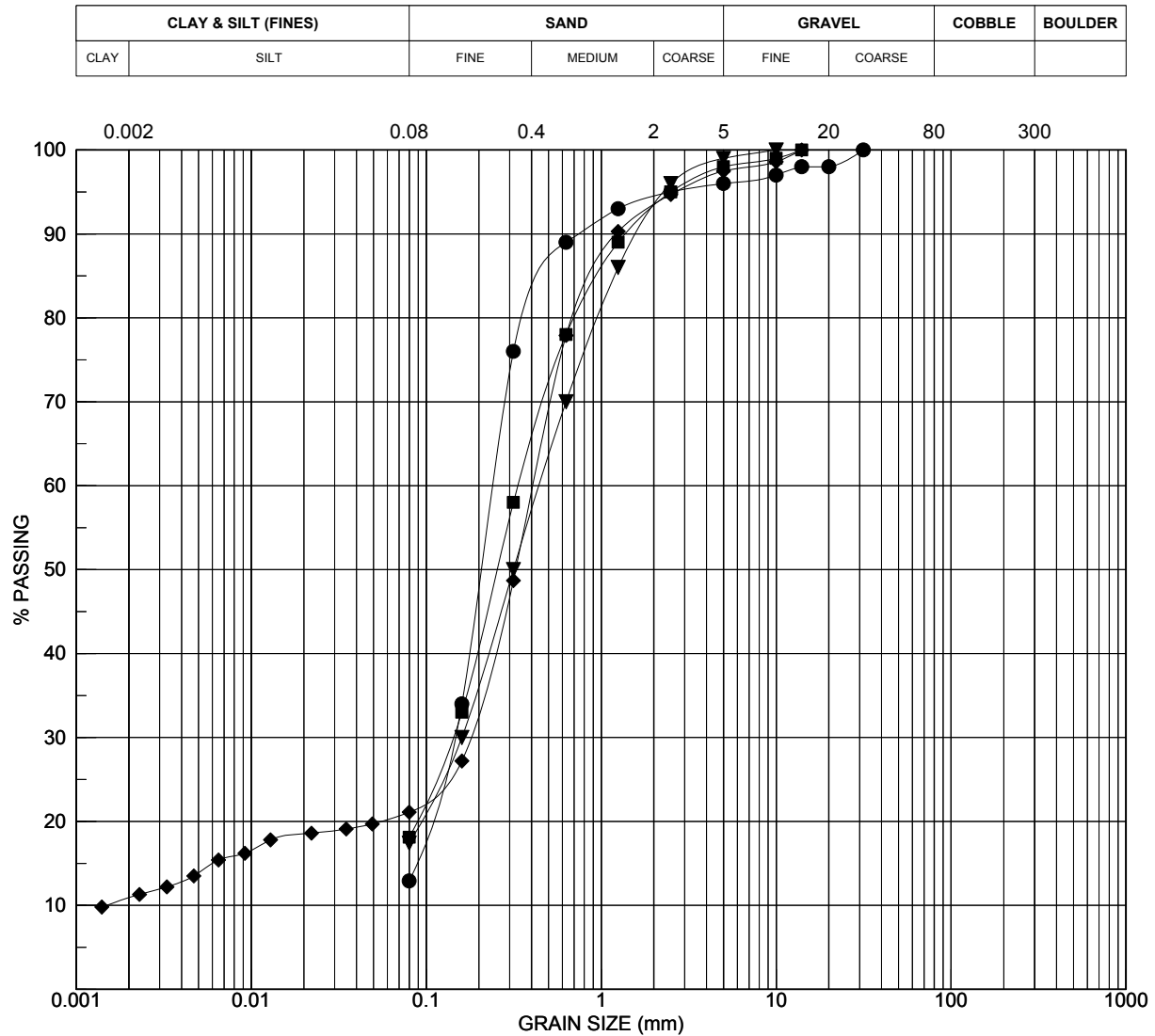
Table 1.1 Rock Mass Rating details (RMR)														
Borehole No.	Geomechanical Zone	From	To	A1	A2	A3	A4a	A4b	A4c	A4d	A4e	A4	Dry RMR	Rock quality
				Compression Strength	RQD	Spacing	Persistence	Aperture	Roughness	Filling	Weathering	Condition of discontinuities (a+b+c+d+e)	(A1+A2+A3+A4+15)	
				(0-15)	(0-20)	(0-20)	(1-6)	(1-6)	(1-6)	(1-6)	(1-6)	(0-30)	(0-100)	
BH-15-03B	Zone with Steepling deeping joints with smooth to polished surfaces, talc weathering. Presence of a fractured zone from 19.88 to 20.0 m.	19.15	20.08	12	14	6	2	3	1	2	5	13	60	Fair
BH-15-03B	Good to Very good Quality rock. Joint conditions are similar. Most joints are sub-horizontal.	20.08	25.92	12	18	10	2	3	5	5	6	21	76	Good
BH-15-04	A single Geomechanical zone. Some joints of various orientation from 1.0 to 4.22 m are possibly slightly open and show an oxydation coating. Weaker joint conditions are observed on the vertical joint at 10.60 m which is coated with fault gouge and where host rock is slightly weathered (Joint Condition Parameters Restricted by this joint). Most joints are sub-horizontal.	1.00	10.73	12	16	7	2	2	1	2	5	12	62	Good
BH-15-05	Minor fractures and/or altered zones are hosted within the granite (brecciated and veined granite). RMR parameters are controled by the fractured and altered zone developed in a gabbro dyke from 11.75-12.05 m. Some joints within the zone are filled by fault gouge, host rock is weathered. Most of joints are inclined or sub-horizontal.	6.10	13.69	12	12	6	2	2	1	2	4	11	56	Fair
BH-15-06	Good Quality Rock. Some joints at low core angle are foliation joints.	3.74	9.23	12	15	6	2	5	5	5	6	23	71	Good
BH-15-06	Rock is moderately to intensely weathered. Many joints are coating by carbonates and chlorite. Some joints are filled with decomposed rock.	9.23	11.83	8	13	7	2	2	3	2	1	10	53	Fair
BH-15-07	Good Quality Rock. Joint Conditions Parameters are restricted by foliation joints coated by chlorite and partly polished.	2.08	9.28	12	17	7	2	5	5	1	6	19	70	Good
BH-15-08	Rock is generally of good quality. Subvertical joints set shows chlorite and/or chlorite and/or talc coating/infilling. Those joints are usually rough and undulating. Presence of an possible open joint near the top of the bedrock (at 5.02 m) explaining the Aperture Joint Condition.	9.16	13.24	12	16	8	2	1	5	1	6	15	66	Good
BH-15-14	Presence of a "void" zone/open joint/fractured zone between 14.39-14.73 m. From 14.73-16.61 m (EOH) : the rock is moderately to strongly weathered. RMR based upon the "void" zone and upon the weathering.	14.09	16.61	9	11	3	2	0	1	0	1	4	42	Fair

APPENDIX 2

LABORATORY TEST RESULTS ON SOIL

CLIENT : Mason Graphite inc. / Hatch Ltée.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

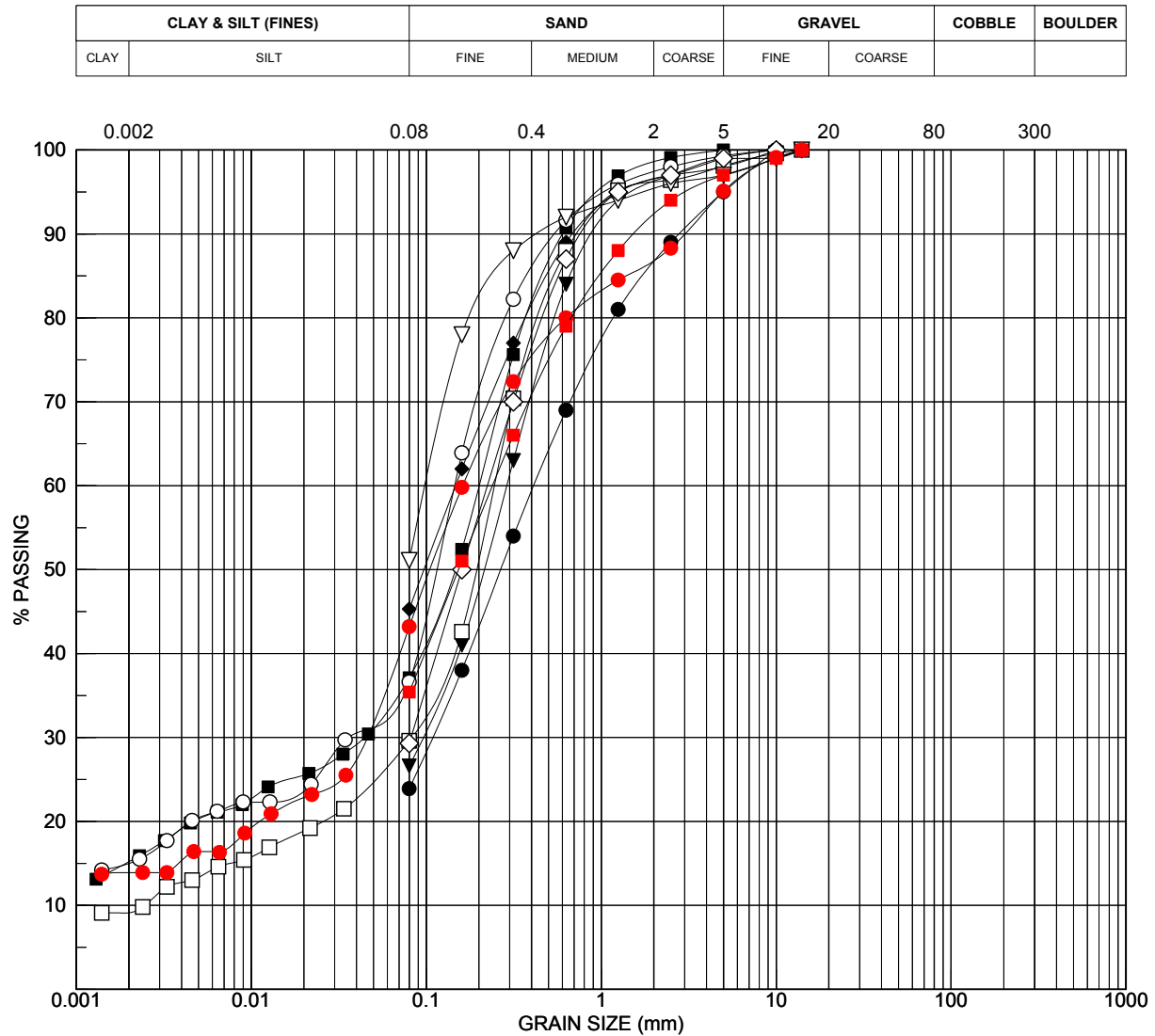
FIGURE 2.1



	Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	TP-15-17	MA-2	0,30 - 0,80	Sand, some silt, traces of gravel.	4	83	13	-
■	TP-15-18	MA-2	0,30 - 0,80	Sand, some silt, traces of gravel.	2	80	18	-
▼	TP-15-28	MA-2	0,30 - 0,80	Sand, some silt, traces of gravel.	1	82	17	-
◆	TP-15-31	MA-3	0,90 - 1,40	Sand, some clay and silt, traces of gravel.	3	76	10	11

CLIENT : Mason Graphite inc. / Hatch Ltée.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

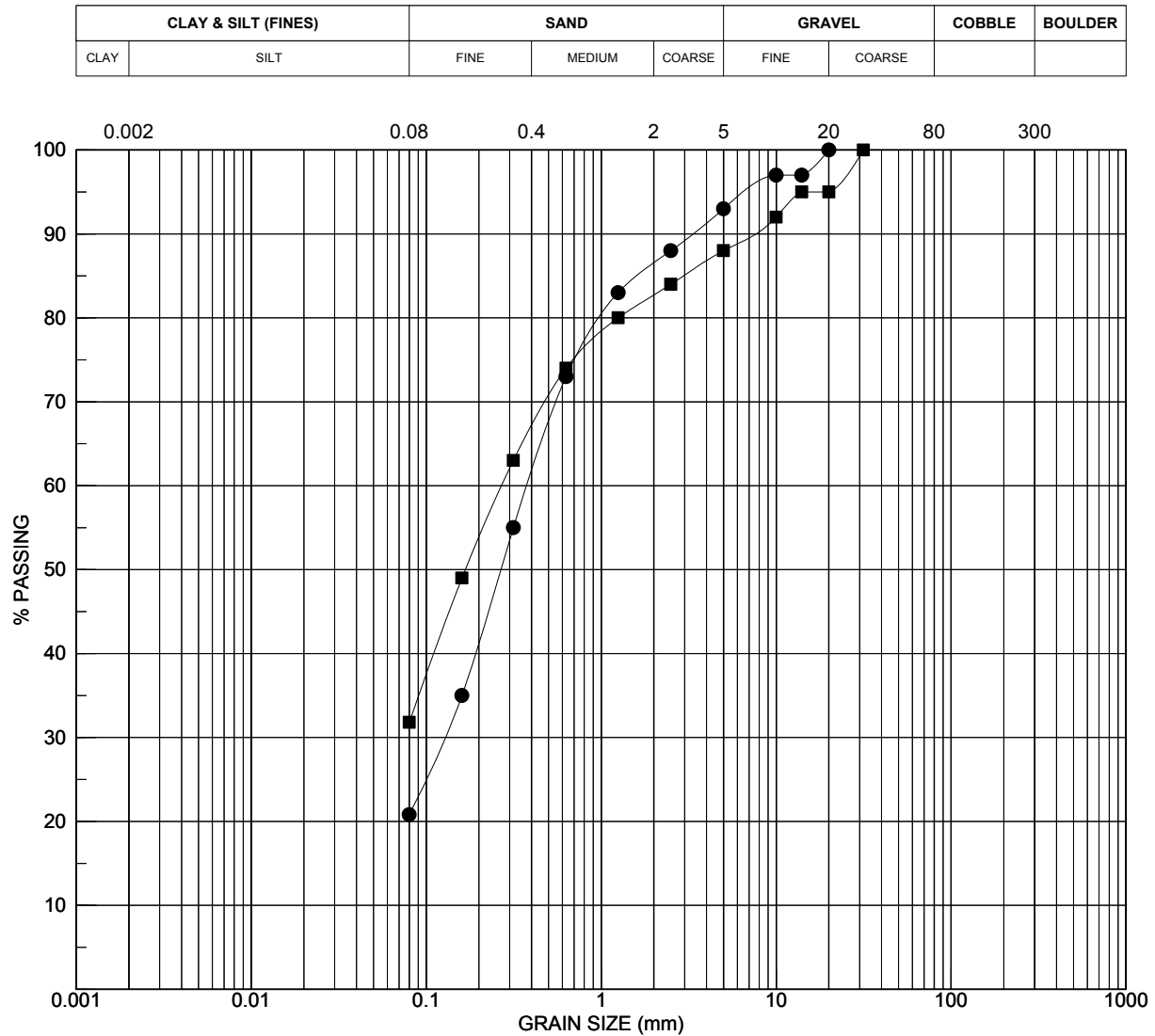
FIGURE 2.2



	Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	TP-15-01	MA-3	0,70 - 1,20	Silty sand, traces of gravel.	5	71	24	-
■	TP-15-03	MA-3	0,50 - 1,00	Silty sand, some clay.	0	63	22	15
▼	TP-15-05	MA-3	0,60 - 1,10	Silty sand, traces of gravel.	1	72	27	-
◆	TP-15-08	MA-3	1,00 - 1,50	Sand and silt, traces of gravel.	2	53	45	-
○	TP-15-17	MA-7	2,80 - 3,30	Silty sand, some clay, traces of gravel.	1	63	22	15
□	TP-15-21	MA-2	0,30 - 0,80	Silty sand, traces of clay and gravel.	2	68	21	9
▽	TP-15-25	MA-2	0,50 - 1,00	Silt and sand, traces of gravel.	3	46	51	-
◇	TP-15-26	MA-2	0,30 - 0,80	Silty sand, traces of gravel.	1	70	29	-
●	TP-15-26	MA-4	1,30 - 1,80	Silty sand, some clay, traces of gravel.	5	52	29	14
■	TP-15-32	MA-3	0,70 - 1,20	Sand and silt, traces of gravel.	3	62	35	-

CLIENT : Mason Graphite inc. / Hatch Ltée.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

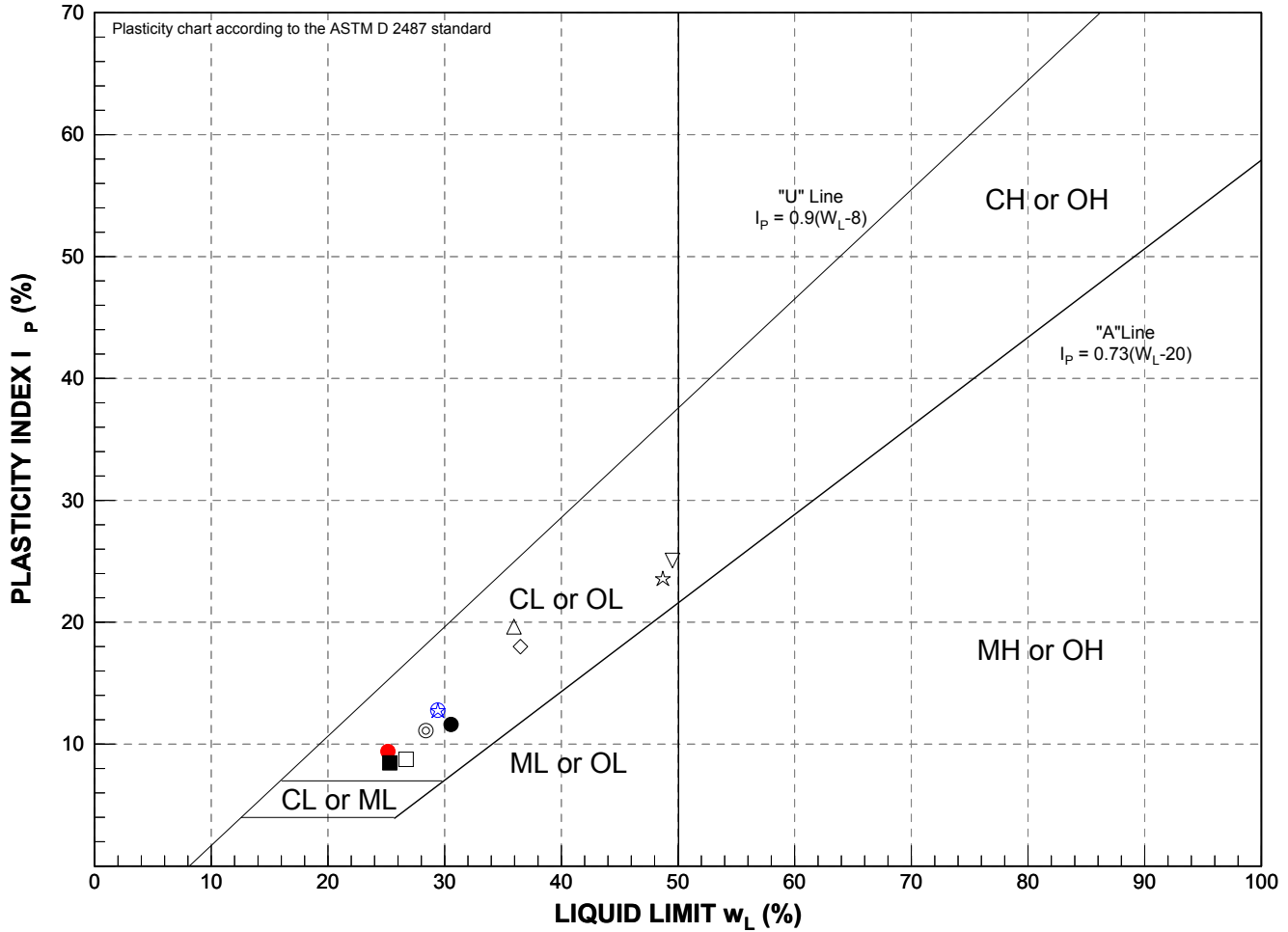
FIGURE 2.4



	Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	BH-15-05	CF-8	4,27 - 4,88	Silty sand, traces of gravel.	7	72	21	-
■	BH-15-14	CF-17	12,09 - 12,70	Silty sand, some gravel.	12	56	32	-

CLIENT : Mason Graphite inc. / Hatch Ltée.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

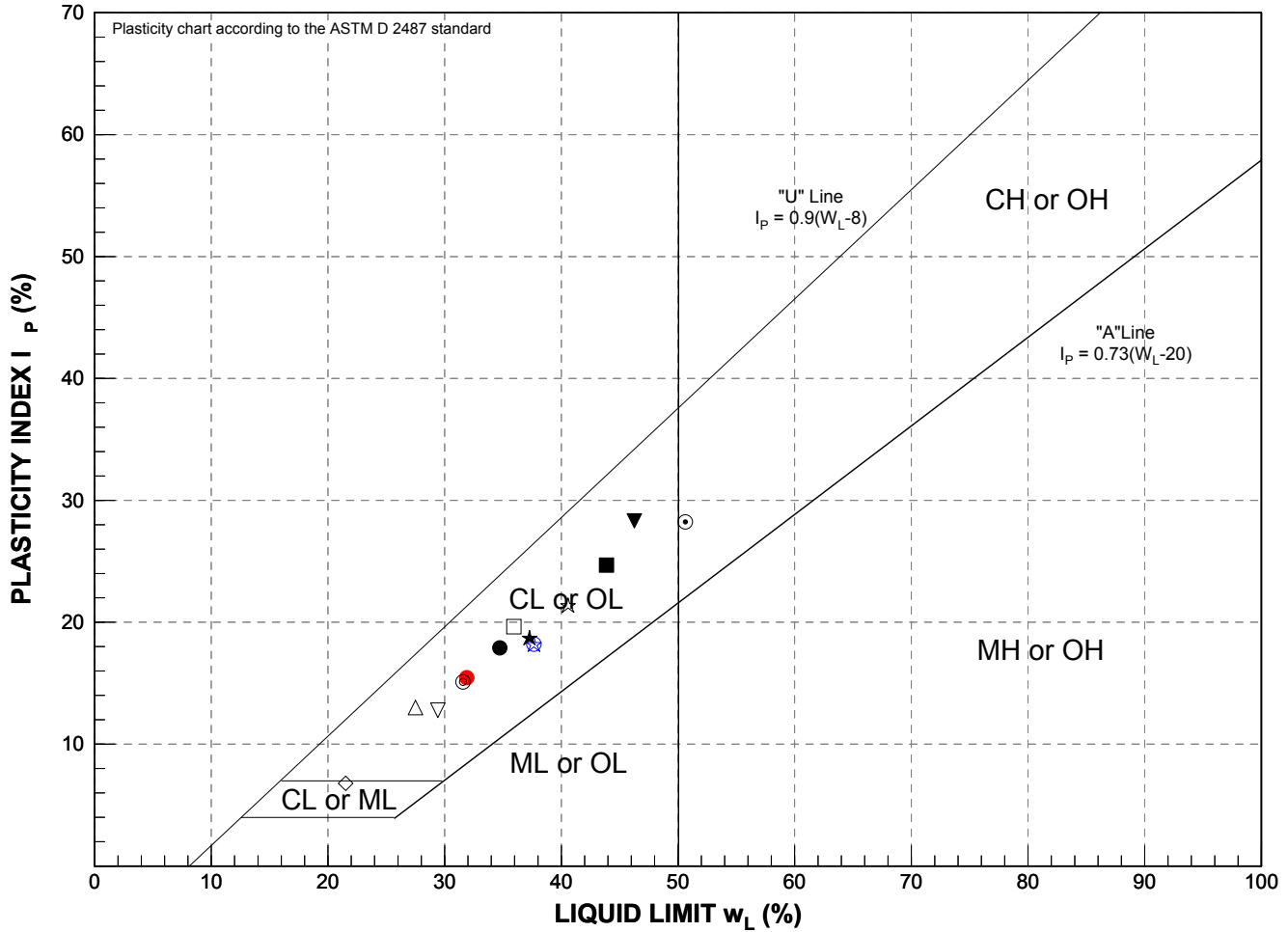
Figure 2.5



Symbol	Borehole	Type	Sample	Depth		w	w _L	w _p	I _L	I _p	USCS	Description
				from	to							
●	BH-15-03	CF	13	8.38	8.99	33	25	16	1.9	9	CL	-
□	BH-15-03	CF	16	10.67	11.28	51	27	18	3.8	9	CL	-
▽	BH-15-03	CF	8	4.57	5.18	58	50	24	1.4	25	CL	-
☆	BH-15-03B	TM	7	3.05	3.76	64	49	25	1.6	24	CL	-
⊙	BH-15-06	TM	14	1.22	1.83	39	28	17	2.0	11	CL	-
◇	BH-15-08	TM	15	3.45	4.16	39	37	19	1.1	18	CL	-
△	BH-15-08	CF	3	1.22	1.83	32	36	16	0.8	20	CL	-
☆	BH-15-08	CF	6	3.05	3.66	39	29	17	1.7	13	CL	-
●	BH-15-14	CF	10	6.10	6.71	43	31	19	2.1	12	CL	-
■	BH-15-14	CF	13	8.38	8.99	37	25	17	2.4	9	CL	-

CLIENT : Mason Graphite inc. / Hatch Ltée.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

Figure 2.6



Symbol	Borehole	Type	Sample	Depth		w	w _L	w _p	I _L	I _p	USCS	Description
				from	to							
●	TP-15-05	MA	5	1.60	2.10	21	32	16	0.3	15	CL	-
□	TP-15-08	MA	3	1.00	1.50	32	36	16	0.8	20	CL	-
▽	TP-15-08	MA	6	2.50	3.00	39	29	17	1.7	13	CL	-
☆	TP-15-16	MA	2	0.20	0.70	37	41	19	0.8	21	CL	-
⊙	TP-15-16	MA	6	2.20	2.70	29	32	16	0.8	15	CL	-
◇	TP-15-17	MA	7	2.80	3.30	21	22	15	0.9	7	CL-ML	-
△	TP-15-20	MA	5	2.00	2.50	27	28	15	0.9	13	CL	-
☆	TP-15-21	MA	6	2.30	2.80	48	38	19	1.6	18	CL	-
●	TP-15-23	MA	4	1.30	1.80	33	35	17	0.9	18	CL	-
■	TP-15-23	MA	8	3.30	3.70	56	44	19	1.5	25	CL	-
▼	TP-15-26	MA	4	1.30	1.80	37	46	18	0.7	28	CL	-
★	TP-15-26	MA	8	3.20	3.50	39	37	19	1.1	19	CL	-
⊙	TP-15-31	MA	4	1.40	1.90	50	51	22	1.0	28	CH	-

Projet: Preliminary Geotechnical Investigation, Concentrator Site, B-C, Qc.	N/Dossier: 632622	Figure: 2.7
Sondage no: BH-15-03B	Échantillon no: TM-7	Profondeur (m): 3,05 à 3,76
Effectué par: P-L. Bouchard	Date: 2015-11-02	Vérfié par: D. Potvin, tech.
		Récupération: 72%
		Approuvé par: A. Duchesne, ing.

Essais en Laboratoire

s_u : résistance au cisaillement non drainé (à l'état intact) (cône suédois), kPa
 s_{urc} : résistance au cisaillement non drainé (à l'état remanié) (cône suédois), kPa
 S_i : sensibilité au remaniement (s_u/s_{urc})
 C: essai de consolidation oedométrique

G: analyse granulométrique
 w: teneur en eau naturelle, %
 w_p : limite de plasticité, %
 w_L : limite de liquidité, %
 γ_h : poids volumique à l'état intact, kN/m³
 D_r : densité relative des grains

"Paraffiné" = échantillon emballé dans une pellicule cellulosique, puis scellé dans un enrobage de paraffine.
 I_p : indice de plasticité, %
 I_L : indice de liquidité

Échelle (centimètre)	Profondeur (m)	Essais en laboratoire	Description de l'échantillon	Stratigraphie
0	3,05		Profondeurs: 3,05 à 3,56 m	
5	3,15	w: 65 % Paraffiné	Silt et argile "organique" gris foncé (colluvions).	
10			Apparence de "bioturbation" rempli d'eau lors de l'extraction et d'un diamètre de 6 mm, orienté horizontalement à 3,48 m de profondeur.	
15			Consistance molle.	
20	3,25	Paraffiné	Plasticité moyenne.	
25			Ultra- sensible.	
30	3,35	Paraffiné	Homogène.	
35			C	
40	3,45	S_u : 18,3 kPa S_{urc} : 0,14 kPa γ_h : 15,77 kN/m ³ w: 64 % w_L : 49 % w_p : 25 % w: 70 %		
45				
50				
55			Perdu	X
60				
65				
70				
75				
80				

Projet: Preliminary Geotechnical Investigation, Concentrator Site, B-C, Qc.	N/Dossier: 632622	Figure: 2.8
Sondage no: BH-15-06	Échantillon no: TM-14	Profondeur (m): 1,22 @ 1,83
Effectué par: P-L. Bouchard	Date: 2015-11-10	Vérfifié par: D. Potvin, tech.
		Approuvé par: A. Duchesne, ing.

Essais en Laboratoire

s_u : résistance au cisaillement non drainé (à l'état intact) (cône suédois), kPa
 s_{urc} : résistance au cisaillement non drainé (à l'état remanié) (cône suédois), kPa
 S_i : sensibilité au remaniement (s_u/s_{urc})
 C: essai de consolidation oedométrique

G: analyse granulométrique
 w: teneur en eau naturelle, %
 w_p : limite de plasticité, %
 w_L : limite de liquidité, %
 γ_h : poids volumique à l'état intact, kN/m³
 D_r : densité relative des grains

"Paraffiné" = échantillon emballé dans une pellicule cellulosique, puis scellé dans un enrobage de paraffine.
 I_p : indice de plasticité, %
 I_L : indice de liquidité

Échelle (centimètre)	Profondeur (m)	Essais en laboratoire	Description de l'échantillon	Stratigraphie
0	1,22		Profondeurs: 1,22 à 1,67 m	
5	1,32	w: 31 % Paraffiné	Silt et argile gris avec traces de sable fin à grossier, Brun de 1,22 à 1,28 m de profondeur.	
10			Gris foncé de 1,28 à 1,67 m de profondeur.	
15			Présence d'un lit de coquilles à 1,53 m de profondeur.	
20			Présence de plans hirozontaux et verticaux s'entrecoupant de 1,52 à 1,59 m de profondeur.	
25	1,52	C S_u : 31,8 kPa S_{urc} : - kPa w : 39 % w_L : 28 % w_p : 17 %	Consistance ferme* à raide. Plasticité faible. Ultra-sensible.	
30				
35	1,62	w : 46 %	*Consistance plus faible et sensibilité plus élevée de 1,56 à 1,67 m de profondeur.	
40				
45	1,67			
50				X
55			Perdu	
60				
65				
70				
75				
80				

Projet: Preliminary Geotechnical Investigation, Concentrator Site, B-C, Qc.	N/Dossier: 632622	Figure: 2.9
Sondage no: BH-15-08	Échantillon no: TM-15	Profondeur (m): 3,45 @ 4,16
Effectué par: P-L. Bouchard	Date: 2015-11-02	Vérfié par: D. Potvin, tech.
		Récupération: 94%
		Approuvé par: A. Duchesne, ing.

Essais en Laboratoire

s_u : résistance au cisaillement non drainé (à l'état intact) (cône suédois), kPa
 s_{urc} : résistance au cisaillement non drainé (à l'état remanié) (cône suédois), kPa
 S_r : sensibilité au remaniement (s_u/s_{urc})
 C: essai de consolidation oedométrique

G: analyse granulométrique
 w: teneur en eau naturelle, %
 w_p : limite de plasticité, %
 w_L : limite de liquidité, %
 γ_h : poids volumique à l'état intact, kN/m³
 D_r : densité relative des grains

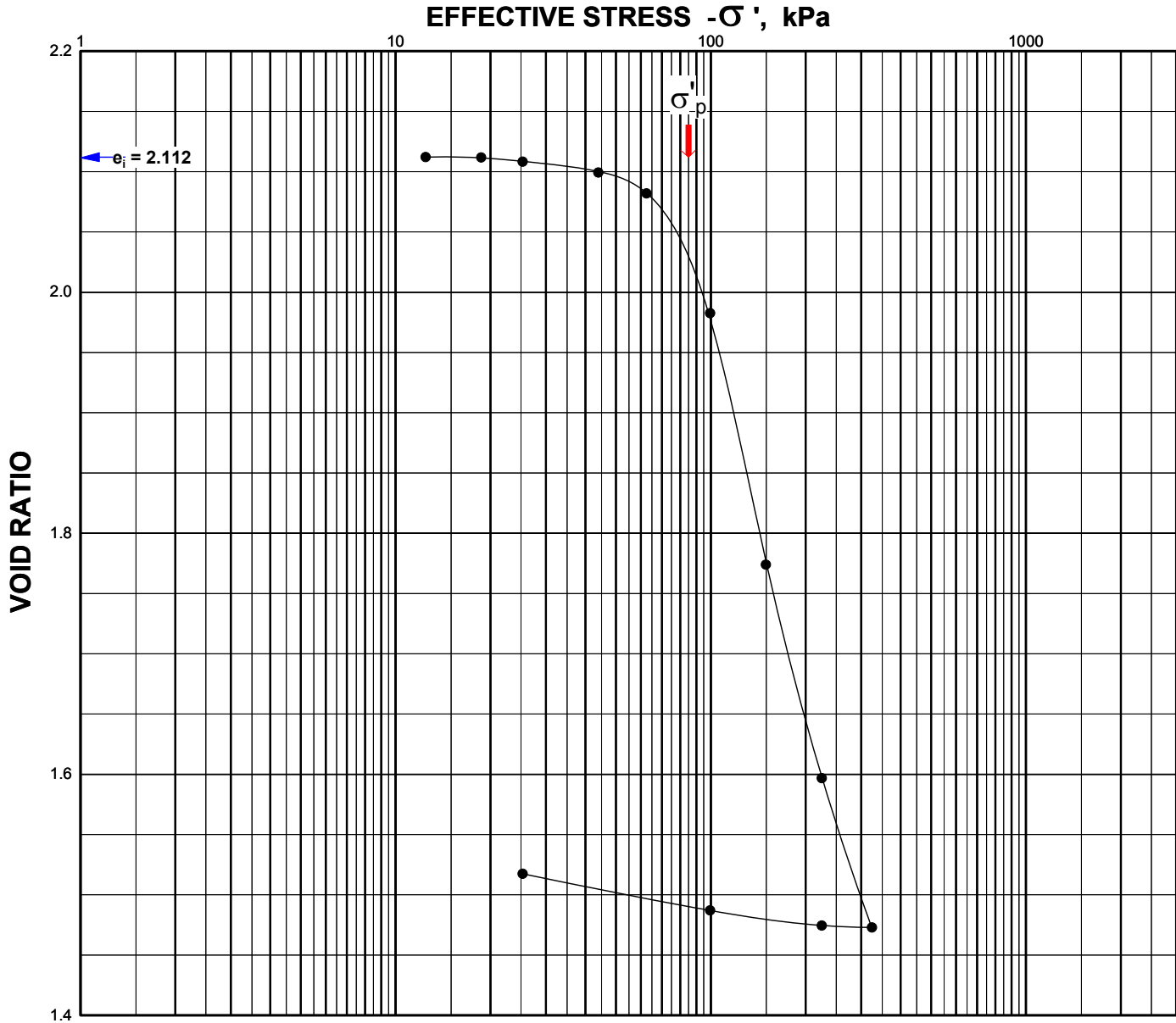
"Paraffiné" = échantillon emballé dans une pellicule cellulosique, puis scellé dans un enrobage de paraffine.
 I_p : indice de plasticité, %
 I_L : indice de liquidité

Échelle (centimètre)	Profondeur (m)	Essais en laboratoire	Description de l'échantillon	Stratigraphie
0	3,45		Profondeurs: 3,45 à 4,12 m	
5			Silt, un peu d'argile à argileux, un peu de sable fin à grossier, traces de gravier.	
10	3,55	w: 25 %	De 3,45 à 3,60 m de profondeur, présence d'oxydation.	
15			Silt et argile gris foncé avec traces de sable fin à grossier de 3,60 à 4,12 m de profondeur.	
20	3,65		Présence d'un gravier d'environ 8 mm de diamètre à 3,75 m de profondeur.	
25		Paraffiné	Consistance ferme.	
30	3,75		Plasticité moyenne.	
35		Paraffiné	Très sensible.	
40	3,85			
45		C k_L		
50	3,95	S_u : 38,6 kPa S_{urc} : 0,84 kPa γ_h : 18,42 kN/m ³		
55		w: 40 %		
60	4,12		Perdu	X
65				
70				
75				
80				

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-03B
SAMPLE : TM-7
DEPTH (m) : 3,05 - 3,76

Figure 2.10



Depth of test (m) : 3.40

RESULTS

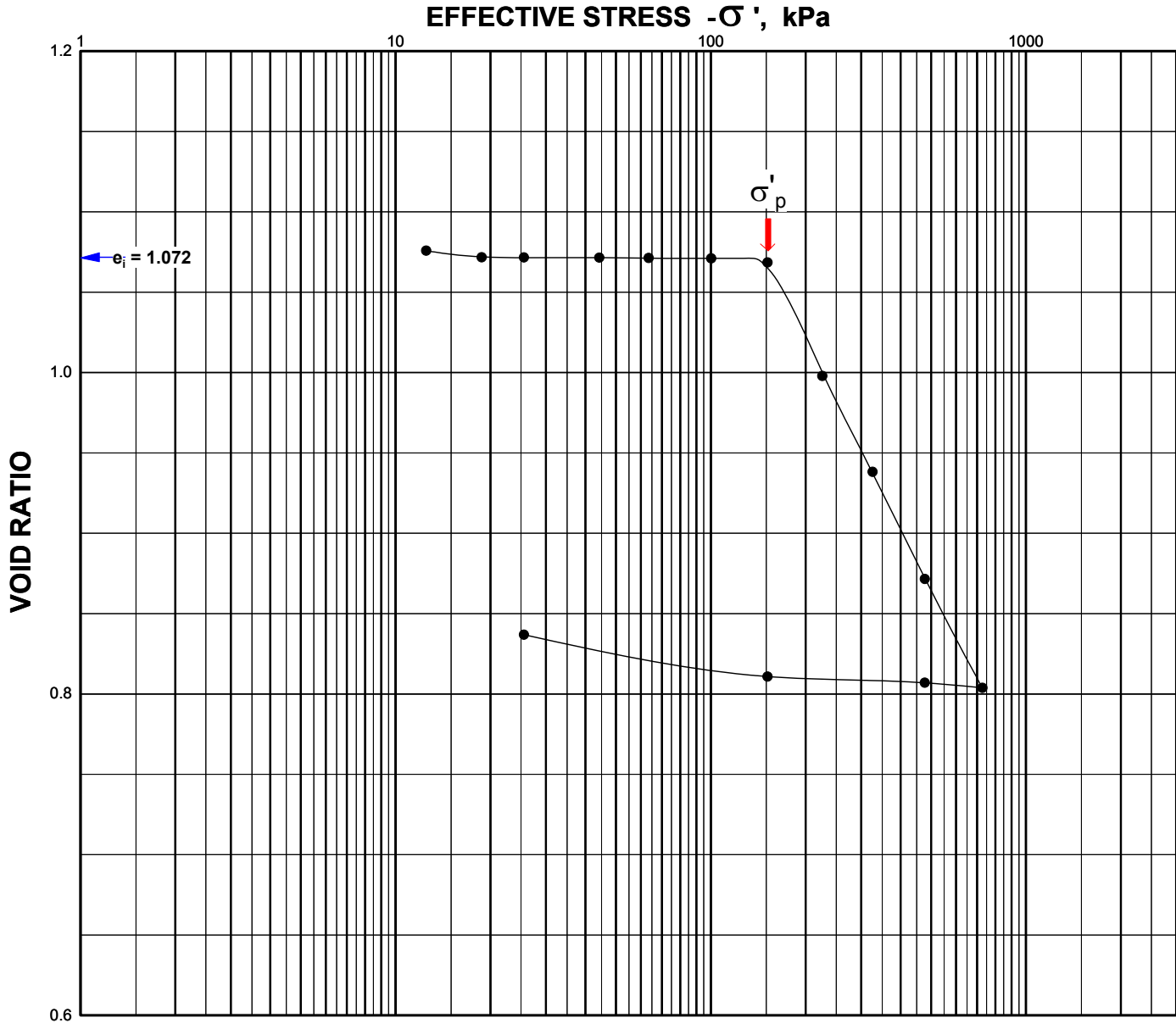
γ : 15.77 kN/m ³		σ'_{vo} : 17 kPa	
e_i : 2.112		σ'_p : 85 kPa	
C_{cr} : 0.025		$\sigma'_p - \sigma'_{vo}$: 68 kPa	
C_c : 1.214			

COMMENTS :

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-06
SAMPLE : TM-14
DEPTH (m) : 1,22 - 1,83

Figure 2.14



Depth of test (m) : 1.53

RESULTS

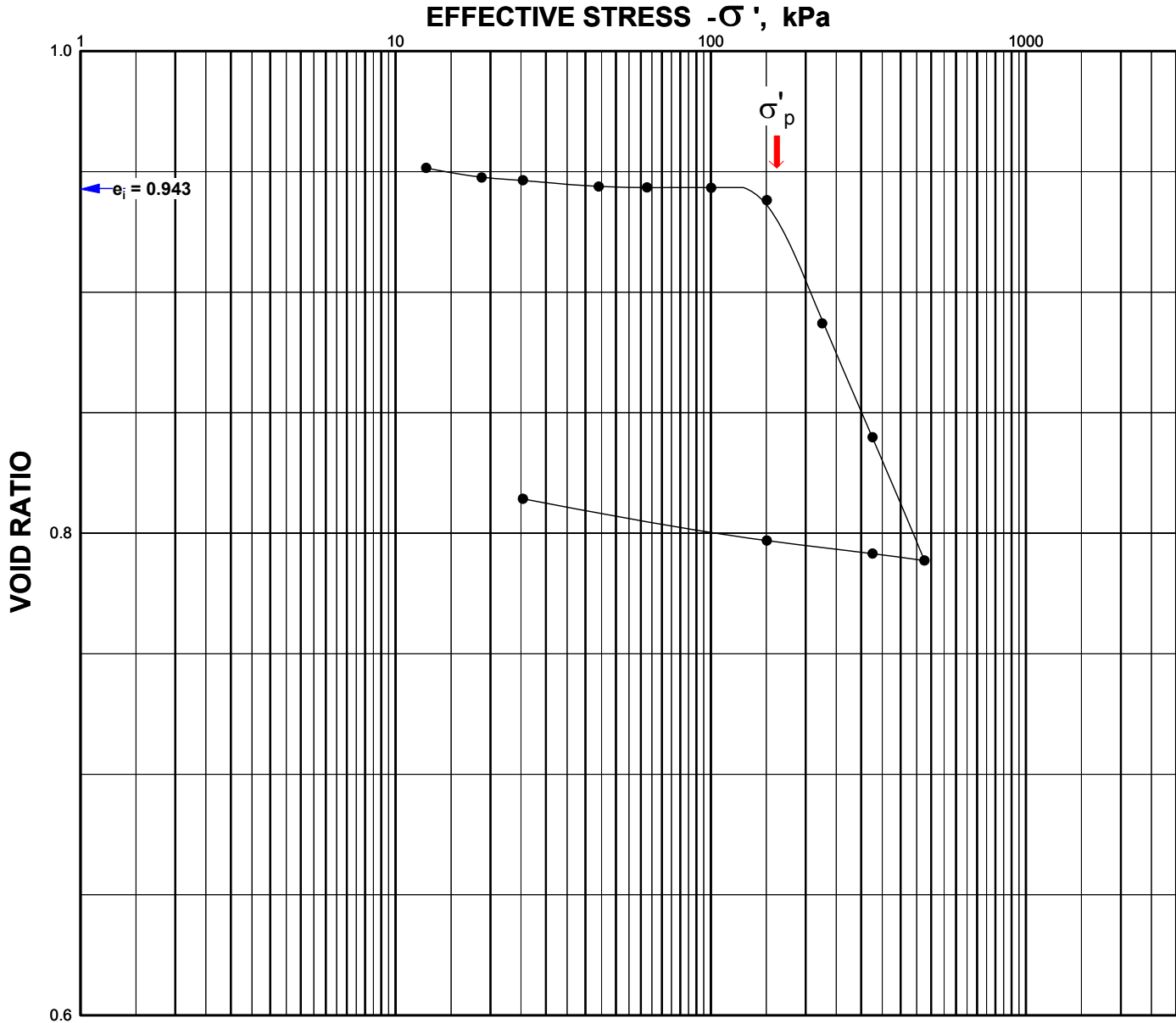
γ : 18.10 kN/m ³		σ'_{vo} : 18 kPa	
e_i : 1.072		σ'_p : 152 kPa	
C_{cr} : 0.001		$\sigma'_p - \sigma'_{vo}$: 134 kPa	
C_c : 0.374			

COMMENTS :

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH-15-08
SAMPLE : TM-15
DEPTH (m) : 3,45 - 4,16

Figure 2.15



Depth of test (m) : 3.81

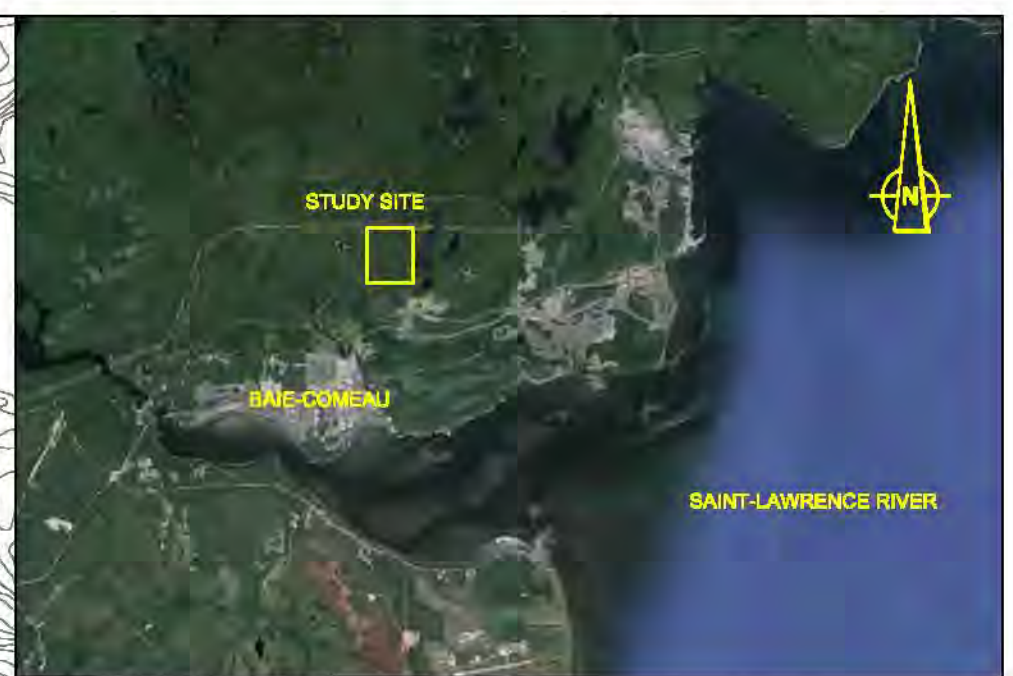
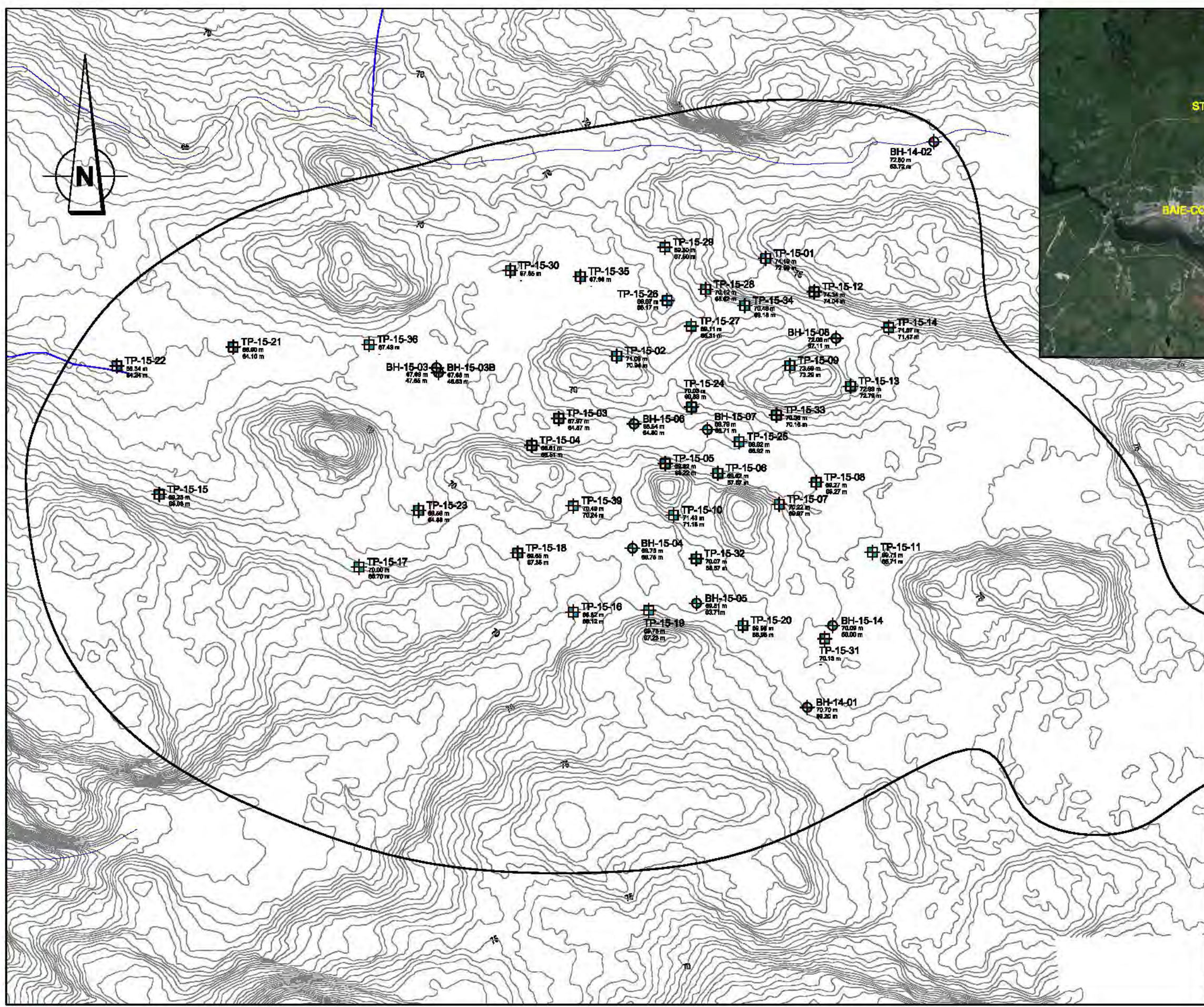
RESULTS

γ : 18.62 kN/m ³		σ'_{vo} : 29 kPa	
e_i : 0.943		σ'_p : 162 kPa	
C_{cr} : 0.008		$\sigma'_p - \sigma'_{vo}$: 133 kPa	
C_c : 0.296			

COMMENTS :

APPENDIX 3

DRAWING 632622.1-01 – SOUNDING LOCATION PLAN



LEGEND

- Borehole 2015
Elevation of surface (m)
Bedrock elevation (m)
Water level elevation (m)
- Test Pit 2015
Elevation of surface (m)
Bedrock elevation (m)
- Projected TMF position
- Water line
- Intermittent stream
- Contour line (m)

Reference:
Topographic data from LIDAR survey provided by HATCH Ltd.

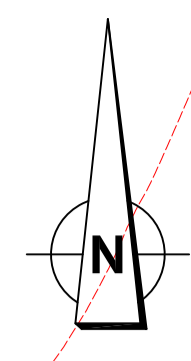
CLIENT: Mason Graphite / Hatch Ltd		
PROJECT: Preliminary Geotechnical Investigation Concentrator Site		
LOCATION: Baie-Comeau, Quebec		
TITLE: Sounding Location Plan Plan Area		
SCALE: 1 : 2500		
DATE: 2015-11-24	FILE: 632622.2	DRAWING: 632622.2-01

F:\009\ACLE\DOSSIERS\632622 - Mason Graphite Concentrator\Desain\632622 Localisation.dwg

APPENDIX 4

DRAWING 632622.1-02 – GEOLOGICAL MAPPING AND PHOTOGRAPHIC REPORT

STUDY SITE



O10	Family 1	Family 2	Family 3
Outcrop nature	Granitic		
General dip	90°	90°	10°
General azimuth	86°	164°	252°
Joint spacing (m)	3.0	2.0 to 3.0	NA

O14	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	140°	200°
Joint spacing (m)	0.8	NA

O16	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	342°	114°
Joint spacing (m)	NA	NA

O9	Family 1
Outcrop nature	Granitic
General dip	89°
General azimuth	338°
Joint spacing (m)	0.1

O3	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	347°	281°
Joint spacing (m)	NA	NA

O12-A	Family 1	Family 2
Outcrop nature	Granitic	
General dip	80°	90°
General azimuth	140°	110°
Joint spacing (m)	0.2 to 0.5	1.5

O12-B	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	150°	80°
Joint spacing (m)	0.3 to 1.0	1.0 to 2.0

O5	Family 1
Outcrop nature	Granitic
General dip	88°
General azimuth	348°
Joint spacing (m)	0.3

LEGEND		
	Borehole 2015 Elevation of surface (m) Bedrock elevation (m)	Zone Peat bog Outcrop Shallow rock Forest
	Test-Pit 2015 Elevation of surface (m) Bedrock elevation (m)	
	Projected TMF position	
	Water line	
	Intermittent stream	
	75 Contour line (m)	
	NA Not available	
	Orientation view of the picture	
	Rocky escarpment	
	O3 Observation number	

Notes:
 1- This drawing must be consulted with the photographic report provided in report 632622.1.
 2- The limit of each zone were interpreted and estimated using field observations and the LIDAR survey.
 3- The GPS points were surveyed using a Garmin GPS (+/- 10 m of precision).

Reference:
 Topographic data from LIDAR survey provided by HATCH Ltd.

Qualitas

CLIENT: Mason Graphite Inc. / Hatch Ltd

PROJECT: Preliminary Geotechnical Investigation
Concentrator site

LOCATION: Baie-Comeau, Quebec

TITLE: Geotechnical Mapping - Plant Area

SCALE: 1 : 1000

DATE: 2015-11-16	FILE: 632622.1	DRAWING: 632622.1-01
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CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 1 (GPS no. 2 to 7; 1 of 2):

Shallow bedrock and outcrops. Granitic rock, covered with a layer of peat 5 to 15 cm thick. No visible structures.



OB01_P01: View in the West direction.



OB01_P02: View in the West direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 1 (GPS no. 2 to 7; 2 of 2):

Shallow bedrock and outcrops. Granitic rock, covered with a layer of peat 5 to 15 cm thick. No visible structures.



OB01_P03: View in the East direction.



OB01_P04: View in the South-East direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 2 (GPS no. 8 to 18, 1 of 3):

Shallow bedrock and outcrops. Grey granitic rock outcrop oriented on a 120°-300° axis, size: 75 m X 15 m. No visible structures. Photos taken while the technician was walking progressively to the North-West next to the outcrop (view in the North-East direction).



OB02_P01: View in the North-East direction.



OB02_P02: View in the North-East direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 2 (GPS no. 8 to 18; 2 of 3):

Shallow bedrock and outcrops. Grey granitic rock outcrop oriented on a 120°-300° axis, size: 75 m X 15 m. No visible structures. Photos taken while the technician was walking progressively to the North-West next to the outcrop (view in the North-East direction).



OB02_P03: View in the North-East direction.



OB02_P04: View in the North-East direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 2 (GPS no. 8 to 18; 3 of 3):

Shallow bedrock and outcrops. Grey granitic rock outcrop oriented on a 120°-300° axis, size: 75 m X 15 m. No visible structures. Photos taken while the technician was walking progressively to the North-West next to the outcrop (view in the North-East direction).



OB02_P05: View in the North-East direction.



OB02_P06: View in the North-East direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 3 (GPS no. 19 to 34; 1 of 4):

Shallow bedrock and outcrops. Outcrop oriented on a 120° - 300° axis. Approximately 2 to 3 metres high. Photos taken while the technician was walking progressively to the West, next to the outcrop (view in the south direction).



OB3_P01: View in the South. Quartz vein trending at 224° , 14 cm thick.



OB3_P02: View in the South.

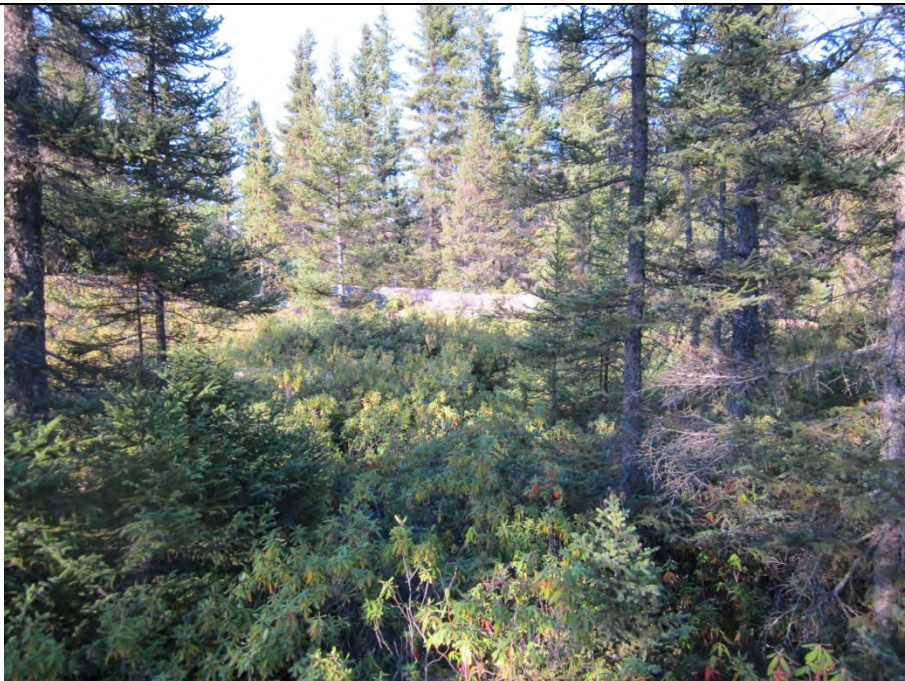
CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 3 (GPS no. 19 to 34; 2 of 4):

Shallow bedrock and outcrops. Outcrop oriented on a 120°-300° axis. Approximately 2 to 3 metres high. Photos taken while the technician was walking progressively to the West, next to the outcrop (view in the south direction).



OB3_P03: View in the South.



OB3_P04: View in the South.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 3 (GPS no. 19 to 34; 3 of 4):

Shallow bedrock and outcrops. Outcrop oriented on a 120°-300° axis. Approximately 2 to 3 metres high. Photos taken while the technician was walking progressively to the West, next to the outcrop (view in the south direction).



OB3_P05: View in the South.



OB3_P06: View in the South.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 3 (GPS no. 19 to 34; 4 of 4):

Shallow bedrock and outcrops. Outcrop oriented on a 120°-300° axis. Approximately 2 to 3 metres high. Photos taken while the technician was walking progressively to the West, next to the outcrop (view in the south direction).



OB3_P07: View in the South.



OB3_P08: View in the South.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 4 (GPS no. 35 to 41; 1 of 3):

Outcrop generally oriented on a West-East axis. The South side of the outcrop was photographed as the technician walked on its border to the West.



OB4_P01: View in the North, East of location TP-15-34 (cancelled test pit).



OB4_P02: View in the North, next to location TP-15-34 (cancelled test pit).

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 4 (GPS no. 35 to 41; 2 of 3):

Outcrop generally oriented on a West-East axis. The South side of the outcrop was photographed as the technician walked on its border to the West.



OB4_P03: View in the North direction, West of location TP-15-34 (cancelled test pit).



OB4_P04: View in the North direction. Between GPS no. 42 and 43, abrupt rock walls between 0.9 to 3.6 m high. Small fragments are detached from the outcrop.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 4 (GPS no. 35 to 41; 3 of 3):

Outcrop generally oriented on a West-East axis. The South side of the outcrop was photographed as the technician walked on its border to the West.



OB4_P05: View in the North direction. GPS no. 42.



OB4_P06: View in the North. West of GPS no. 42.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 5 (GPS no. 45 to 52; 1 of 3):

Outcrop of gneissic nature with a general foliation oriented at 280° . This outcrop is the extension to the West of the outcrop described in Observation 3.



OB5_P01: View in the South-West direction.



OB5_P02: View in the South direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 5 (GPS no. 45 to 52; 2 of 3):

Outcrop of gneissic nature with a general foliation oriented at 280° . This outcrop is the extension to the West of the outcrop described in Observation 3.



OB5_P03: View in the South direction.



OB5_P04: View in the South-West direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 5 (GPS no. 45 to 52; 3 of 3):

Outcrop of gneissic nature with a general foliation oriented at 280° . This outcrop is the extension to the West of the outcrop described in Observation 3.



OB5_P05: View in the South-West direction.



OB5_P06: View in the South direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 6 (GPS no. 53 to 66; 1 of 2):

Vast shallow rock and outcrop zone. No visible structures. Covered with a thin layer of peat. Photos taking on the North limit of the observed area. The general dip on the ground surface is towards the North. Observation made between test-pit TP-15-15 and TP-15-17.



OB6_P01: View in the West direction.



OB6_P02: View in the West direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 6 (GPS no. 53 to 66; 2 of 2):

Vast shallow rock zone. No visible structures. Covered with a thin layer of peat. Photos taken on the North limit of the observed area. The general dip on the ground surface is towards the North. Observation made between test pit TP-15-15 and TP-15-17.



OB6_P03: View in the South direction. Next to test pit TP-15-17.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 7 (GPS no. 67 to 70; 1 of 3):

Vast shallow rock zone (granitic rock). No visible structures. Covered with a thin layer of peat. Extension to the West of the shallow rock zone observed in Observation 6. Photos were taken while walking in the North-West direction.



OB7_P01: View in the South direction.



OB7_P02: View in the South direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 7 (GPS no. 67 to 70; 2 of 3):

Vast shallow rock zone (granitic rock). No visible structures. Covered with a thin layer of peat. Extension to the West of the shallow rock zone observed in Observation 6. Photos were taken while walking in the North-West direction.



OB7_P03: View in the South direction. Rock wall from 4 to 5 metres high. Some fragments detached from the rock wall.



OB7_P04: View in the South direction. Rock wall from 4 to 5 metres high. Some fragments detached from the rock wall.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 7 (GPS no. 67 to 70; 3 of 3):

Vast shallow rock zone (granitic rock). No visible structures. Covered with a thin layer of peat. Extension to the West of the shallow rock zone observed in Observation 6. Photos were taken while walking in the North-West direction.



OB7_P05: View in the South direction.



OB7_P06: View in the South direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 8 (GPS no. 71 to 87; 1 of 3):

Vast outcrop zone (granitic rock). Photos taken while walking from West to East. No visible structures.



OB8_P01: General view of the outcrop zone.



OB8_P02: General view of the outcrop zone.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 8 (GPS no. 71 to 87; 2 of 3):

Vast outcrop zone of granitic nature. Photos taken while walking from West to East. No visible structures.



OB8_P03: General view of the outcrop zone.



OB8_P04 : General view of the outcrop zone.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 8 (GPS no. 71 to 87; 3 of 3):

Vast outcrop zone (granitic rock). Photos taken while walking from West to East. No visible structures.



OB8_P05: View in the North. GPS no. 77 to 78: Rock wall 6 m high with a general dip of 55° in the 110° direction. Covered with a thin layer of peat.



OB8_P06: View in the North. GPS no. 77 to 78: Rock wall 6 m high with a general dip of 55° in the 110° direction. Covered with a thin layer of peat.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 9 (GPS no. 88 to 105; 1 of 4):

Shallow rock zone. Approximately 2 or 3 metres higher than the surroundings. Covered with approximately 30 cm of peat (maybe more in certain areas). General orientation of the shallow rock is on an East-West axis.



OB9_P01: View in the West direction. GPS no. 88.



OB9_P02: View in the West direction. GPS no. 89.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 9 (GPS no. 88 to 105; 2 of 4):

Shallow rock zone. Approximately 2 or 3 metres higher than the surroundings. Covered with approximately 30 cm of peat (maybe more in certain areas). General orientation of the shallow rock is on an East-West axis.



OB9_P03: View in the East direction. On the West side of this outcrop, some boulders are detached from a 2-m-high rock wall. Open joints are visible.



OB9_P04: View in the East direction. On the West side of this outcrop, some boulders are detached from a 2-m-high rock wall. Open joints are visible.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 9 no. (GPS 88 to 105; 3 of 4):

Shallow rock and outcrop zone. Approximately 2 or 3 metres higher than the surroundings. Covered with approximately 30 cm of peat (maybe more in certain areas). General orientation of the shallow rock is on an East-West axis.



OB9_P05: View in the North direction. GPS no. 90 to 93.



OB9_P06: View in the North direction. GPS no. 90 to 93.

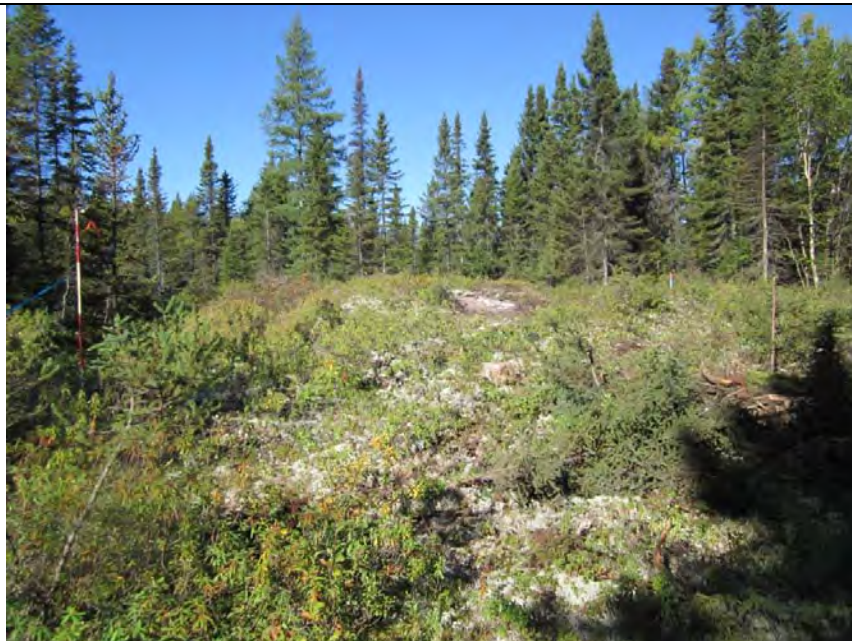
CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 9 (GPS no. 88 to 105; 4 of 4):

Shallow rock zone. Approximately 2 or 3 metres higher than the surroundings. Covered with approximately 30 cm of peat (maybe more in certain areas). General orientation of the shallow rock is on an East-West axis.



OB9_P07: View in the North direction. GPS no. 90 to 93.



OB9_P08: View in the West. GPS no. 98.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 10 (GPS no. 106 to 117; 1 of 2):

Outcrop of granitic rock. Approximately 3 to 4 m high. Big boulders of rock detached from the outcrop. Mostly covered with peat. No visible structures.



OB10_P01: View in the South direction.



OB10_P02: View in the West direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 10 (GPS no. 106 to 117; 2 of 2):

Outcrop of granitic rock. Approximately 3 to 4 m high. Big boulders of rock detached from the outcrop. Mostly covered with peat. No visible structures.



OB10_P03: View in the South direction. Rock wall.



OB10_P04: View in the South direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 11 (GPS no. 119 to 131; 1 of 4):

Vast shallow rock zone. In average, 4 m higher than the surrounding area. Rock wall dip is approximately 60°. Covered with 30 cm of peat.



O11_P01: View in the North direction. GPS no. 119.



O11_P02: View in the North direction. GPS no. 123.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 11 (GPS no. 119 to 131; 2 of 4):

Vast shallow rock zone. In average, 4 m higher than the surrounding area. Rock wall dip is approximately 60° . Covered with 30 cm of peat.



O11_P03: View in the South direction. GPS no. 124, next to test pit TP-15-42.



O11_P04: View in the East direction. GPS no. 127.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 11 (GPS no. 119 to 131; 3 of 4):

Vast shallow rock zone. In average, 4 m higher than the surrounding area. Rock wall dip is approximately 60°. Covered with 30 cm of peat.



O11_P05: View in the East direction. GPS no. 127.



O11_P06: View in the East direction. GPS no. 127.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 11 (GPS no. 119 to 131; 4 of 4):

Vast shallow rock zone. In average, 4 m higher than the surrounding area. Rock wall dip is approximately 60° . Covered with 30 cm of peat.



O11_P07 View in the North direction. GPS no. 130.



O11_P08: View in the West direction. Next to test pit TP-15-07.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 12 (GPS no. 132 to 140; 1 of 2):

Shallow rock zone. Granitic rock. Covered with a thin peat layer from 0 to 20 cm thick.



O12_P01: View in the North direction. GPS no. 132.



O12_P02: View in the West direction. GPS no. 137.

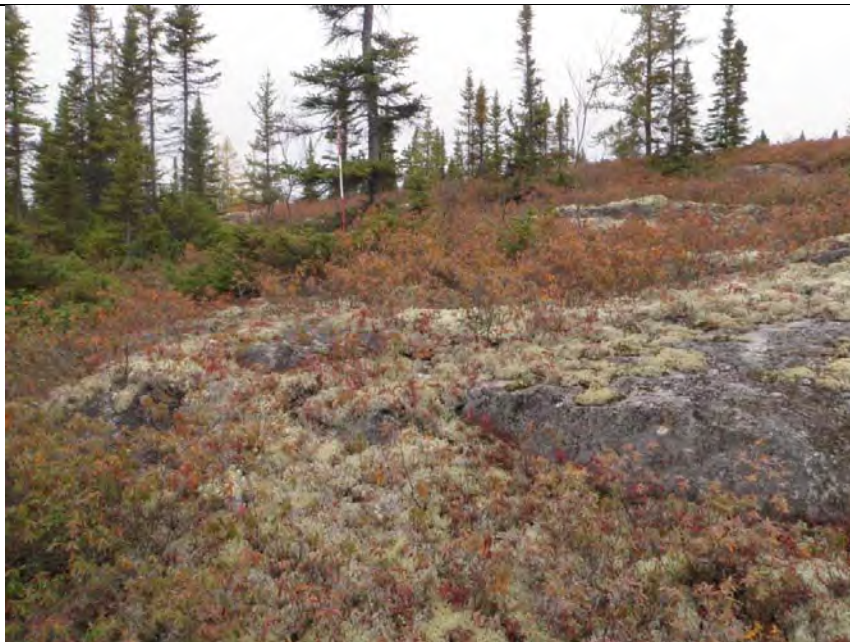
CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 12 (GPS no. 132 to 140; 2 of 2):

Shallow rock zone. Granitic rock. Covered with a thin peat layer from 0 to 20 cm thick.



O12_P03: View in the North-West direction. GPS no. 138.



O12_P04: View in the North-West direction. GPS no. 139.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 13 (GPS no. 141 to 155; 1 of 1):

Peat bog area covered with many spruces. Peat layer at least 1 m thick.



O13_P01: View in the East direction.



O13_P02 : View in the North-East direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 14 (GPS no. 162 à 175; 1 of 1):

Peat bog area covered with many spruces . Peat layer at least 1 m thick.



O14_P01: View in the west direction. GPS no. 162.



O14_P02: Soft soil zone with at least 1-m-thick layer of peat.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 15 (GPS no. 176; 1 of 1):
Intermittent stream, 0.3 to 1.5 m wide.



O15_P01: View in the West direction.



O15_P02: View in the East direction.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 16 (GPS no. 177 to 185; 1 of 1):
Outcrop zone.



O16_P01: View in the South direction. GPS no. 177.



O16_P02: View in the South direction. GPS no. 177.

CLIENT : Mason Graphite / Hatch Ltd.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.1

Observation 17 (GPS no. 156 à 161; 1 of 1):
Shallow rock zone



O17_P01: View of the shallow bedrock stripped with the excavator at location.

APPENDIX 5

BENCHMARK SPECIFICATIONS

DESCRIPTION STATION PERMANENTE

No. POINT: ST-1		DATE: 2013-08-13		ACCÈS ET SITUATION: Le point est situé sur le côté droit de l'avenue Du Labrador, à Baie-Comeau, au chaînage 0+650
PROJET: 154-09-0118	BALISAGE: Plaque sur poteau de bois	HAUTEUR: N/A		
COORDONNÉES: NAD 83 (SCRS)				TRANSPORT: Automobile
LATITUDE:		N/A		
LONGITUDE:		N/A		
COORDONNÉES :SCOPQ NAD83 (SCRS)				
FUSEAU 6				
Y	5 453 338.317			
X	251 323.527			
Z	69.567			
TYPE DE REPÈRE: Médaillon de Zinc				



PAR : Groupe Cadoret, Arpenteurs-Géomètres

DATE: 19 septembre 2013

APPENDIX 6

SCOPE OF THE REPORT

SCOPE OF THE REPORT

GENERAL

This report has been prepared in accordance with the terms of reference of the task assigned to Groupe Qualitas Inc. and on the belief that the design of the structures will be in conformity with the standards and codes in force. If the project design, site or elevation is changed, Groupe Qualitas Inc. shall be consulted in order to confirm the validity of the recommendations made in this report or to change them if required.

The recommendations made in this report are only intended for the designers during the design phase. The number of test holes to determine all the relevant subsurface conditions that may affect the construction costs, the choice of the job site equipment and techniques, the schedule and sequence of the project work or any other consideration related to the construction itself, should normally be greater than the number of test holes made only for design purposes. The contractors, who are bidding or who will be carrying out the works, will have to take into account the limited scope of this report and they will have to rely on their own investigations and on their own interpretation of the test hole results to determine how the subsurface conditions may affect their works.

FOLLOW-UP OF DESIGN AND WORKS

Not all the design and construction details may be known when Groupe Qualitas Inc. submits its report. Therefore, it is recommended that the services of Groupe Qualitas Inc. be consulted during the final design stage to revise the design drawings and the specifications relating to the foundations, the earthwork, the soil retaining and drainage systems, to check and make sure that from a geotechnical viewpoint they are consistent with the report. If such a revision was impossible, Groupe Qualitas Inc. will not assume any responsibility for the interpretation by third parties of the recommendations made in the report and in particular if the final design differs from the design that has been reviser.

It is recommended to use Groupe Qualitas Inc. services during the construction period to confirm and establish that the subsurface conditions over the whole site area do not differ from those specified in Groupe Qualitas Inc. report, and to confirm and establish that the construction work has not had an adverse effect regarding the recommendations made in this report.

SUBSURFACE CONDITIONS

The soil formations change over a more or less large area. The borehole records merely indicate the approximate conditions of the formations at the location of the test hole. The contacts between the various layers given in the records often are not of a distinct nature, they rather correspond to transition zones, and therefore they formed the subject of interpretation.

The groundwater levels indicated in this report correspond only to those recorded at the location and on the date specified in the report. These conditions may vary according to season or due to construction work on the job site or adjacent sites.

If the conditions found on the site differ significantly from those indicated in this report, either due to the heterogeneous conditions or due to the construction work, the client, as a condition to use the report, shall inform Groupe Qualitas Inc. of the changes involved and shall give them the opportunity to review the recommendations made in this report. Some experience is required to recognize a change in the soil conditions. Therefore, it is recommended that an experienced geotechnical engineer be sent to the site in order to check whether the conditions have changed significantly

The environmental conditions of the site indicated in this report correspond to those detected at the location and the date of the sampling presented in this report. They can vary with time following activities on the subject site, on the adjacent sites or following natural reactions or other events. The concentrations are determined with the chemical analysis results carried out on a limited number of samples. Concentrations can vary between the sampling points. The analytical program was elaborated with the information available at the beginning of the project. This program also takes into account the budget and deadline restrictions. The fact that a parameter was not analyzed does not exclude the presence of a concentration superior to the background level or to the detection limit of this parameter.

Annexe Q

Preliminary Geotechnical Investigation Report - Concentrator site - Tailings Management Facility (Qualitas, 2015)



Qualitas

GROUPE QUALITAS INC.
3306, boul. Saint-François
Jonquière (Québec)
Canada G7X 2W9
www.qualitas.qc.ca

Tél. : 418-547-5716
Télec. : 418-547-0374

MASON GRAPHITE INC.
3030 Le Carrefour blvd.
Suite 600
Laval, Quebec H7T 2P5

 **HATCH™**

REFERENCE DOCUMENT

No: E347199-QUAL-15-124-0002_Sub001

Preliminary Geotechnical Investigation Report Concentrator site - Tailings Management Facility

Baie-Comeau, Quebec, Canada

Qualitas Project No. : 632622
Mandate No. : 632622.2
Hatch Reference No. : H347199

Distribution :

- Jean L'Heureux, Eng.
Executive Vice President, industrial process development,
Mason Graphite inc. (PDF)
- Emmanuelle Arié, Eng., M.A.Sc.
Senior geotechnical engineer, Hatch Ltée (PDF)
- Derek Li, M.A.Sc., P.Eng.
Senior geotechnical engineer, Hatch Ltée (PDF)

GROUPE QUALITAS INC.

December 17th, 2015



Martin Dolbec, Eng.
Project manager
OIQ member number: 128835

Martine Chabot, jr. Eng.
Project assistant
OIQ member number : 5045706



Alexandre Aubin, Eng.
Geological engineer
OIQ member number: 144629

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(This report is composed of 135 pages including appendices and cannot be reproduced in part without the permission of Groupe Qualitas Inc.)

1.0 INTRODUCTION

1.1 MANDATE

Mason Graphite Inc. (Mason Graphite) acquired claim rights on a native graphite deposit located near Lac Gueret, about 80 km North-West from the Daniel Johnson Dam (Manic 5), in Quebec's North Shore region. In addition, the plant (concentrator and storage of processed graphite) and the Tailings Management Facility (TMF) will be located in the area of Baie-Comeau (QC) in Jean-Noël-Tessier industrial park.

Mason Graphite mandated Groupe Qualitas Inc. (Qualitas) to carry out two previous mandates related to the current project. The first mandate was a geotechnical and geomechanical investigation campaign to collect data on the Lac Gueret property (Report No.623409, dated April 1st, 2015). The second mandate was a geotechnical investigation campaign to collect data on one of the considered sites for the concentrator, in the Jean-Noël-Tessier industrial park, in Baie-Comeau (Report No.626738, dated April 21st, 2015).

As part of this ongoing project, Mason Graphite mandated Qualitas for a third investigation which aimed to collect more geological and geotechnical data on the selected location of the future plant and TMF site.

The project follows the acceptance of our service proposal No. 15-02131, dated September 16th 2015 and the purchase order No. 2015-0917B issued by Mason Graphite on September 17th 2015. This mandate is divided into two sub-mandate performed concomitantly.

Mandate 1: no. 632622.1 - Preliminary geotechnical investigation of **plant area**;

Mandate 2: no. 632622.2 - Preliminary geotechnical investigation of **TMF area**.

This paper presents the work done for Mandate 2. Qualitas has therefore followed the work program described by Hatch in the technical document titled: *Summary of Work* (Document No. H347199-0000-15-123-0001, Rev. 0, dated August 28th, 2015). Throughout the field work, Qualitas worked in close collaboration with the client and his consultant (Hatch) to optimize the work program and to be able to rapidly adjust the work program depending on the collected field data.

1.2 SITE DESCRIPTION

Mason's Graphite projected plant and TMF site is to be located a few kilometres North of Baie-Comeau in the Jean-Noël-Tessier industrial park. The field work area is located at some distance to the South-West of Petit-Bras Lake and is accessible via road 138 and the Petit-Bras lake road. The plant area is located in the South part of the site whereas the TMF area is located in the North. The following Figure 1 shows the approximate location of the proposed concentrator site. For further details on the location of the projected TMF area, refer to drawing 632622.2-01, in Appendix 5.



Figure 1 - Approximate location of the concentrator site (plant + TMF)¹

¹ Google Map, online 2015-12-07

1.3 PROJECT SUMMARY

Prior to the field work, an authorization certificate was issued by the *Société d'expansion de Baie-Comeau* (certificate no. 16-3B-2015, delivered on November 1st), allowing Qualitas to realize the geotechnical investigation.

The fieldwork for the plant and TMF area (realized concomitantly) has been carried out from September 21st to October 17th, 2015. The TMF area fieldwork includes :

- Field visit;
- Wood-clearing work;
- Geological mapping;
- Diamond drilling of 4 boreholes;
- 18 test pits;
- Soil and rock sampling;
- Determination of the hydraulic conductivity of the rock mass in 4 boreholes (Packer tests);
- 3 monitoring well installations;
- 1 Casagrande piezometer installation;
- Determination of the hydraulic conductivity in 3 boreholes (Slug test);
- Surveying of test locations;
- General petrographic and geomechanical core descriptions;
- Selection of rock core samples for laboratory tests;
- Selection of soil samples for laboratory tests.

Back in the office, core logging and laboratory testing on soil and rock were performed. Also, some environmental soil samples were collected in some of the test pits as planned in the original scope of work but no chemical analyses were carried out. Therefore, only geotechnical testing was carried out on soil samples at the request of Hatch.

This report presents the work details and method, the geological and geotechnical characteristics of soils and rock and the groundwater conditions encountered at the projected TMF site.

2.0 WORK DETAILS AND METHODS

2.1 FIELD VISIT

A field visit was carried out prior to the geotechnical investigation to position every test location. The visit was realized on the 9th and 10th of September by Mr. Normand Tremblay (field supervisor) and Mr. Harley-David Malouin (technical assistant), both from Qualitas.

Furthermore, this visit aimed to prepare path clearing by determining favorable access trails to the test locations. Our field supervisor chose the different trails while taking into account the terrain topography and the trees density to reduce wood clearing time and cost.

2.2 WOOD CLEARING WORK

The wood clearing work was carried out by *Les Entreprises Forestières J.P. Deschênes* (RCI's subcontractor) under the constant supervision of Mr. Hugues Potvin, of Qualitas.

5-meters-wide trails were cleared for the machinery. Along the paths trees more than 10 cm (4 inches) in diameter were cut and neatly piled on the trailside. Some logs were reused to build bridges across boggy areas.

The following figures show general view of the land-clearing work.



Figure 2 - General view of the land-clearing work



Figure 3 - Tree trunks placed across the path, on soft terrain

2.3 BOREHOLE DRILLING

Prior to drilling, the sites were leveled using a Komatsu PC138 hydraulic excavator used for the test pits and provided by a local contractor.

All the boreholes were drilled using a CME-55 drill, mounted on a CME-300 tracked carrier (Figure 4) using the cased wash boring method. The drilling and other equipments mentioned above were owned and operated by Forage André Roy Inc., subcontracted by Qualitas. A total of four (4) boreholes were drilled under mandate 632622.2 in the TMF area. Borehole locations are shown on drawing 632622.2-01 in Appendix 5.



Figure 4 - CME-55 drill in operation

The field team, the material and the core boxes were transported using a track-mounted all-terrain vehicle. The drilling and test water supply was transported from Petit-Bras Lake to the sites in a reservoir, using a Komatsu's CD 110R crawler (Figure 5) provided by the contractor.



Figure 5 - Qualitas subcontractor's Komatsu CD 110R crawler

The four boreholes (BH15-TMF-01 to BH15-TMF-04) were drilled to provide geotechnical information on the overburden and surface bedrock. A NW-size casing shoe was used to drill the surface deposit. Soil samples were collected using a 60-mm-long split- spoon driven by a 63.5 kg hammer, in accordance with the ASTM D1586 standard. Standard Penetration Test (SPT) “N” values were recorded at the same time. Once the casing reached the bedrock, the borehole was continued using a NQ-size core sampler (core diameter : 47.6 mm). All boreholes were stopped once the field team reached the ending criteria (coring 6 m in solid rock, corresponding to a TCR of 90 % and a RQD of more than 75 %).

The drilling length of the four boreholes varied from 7.51 to 9.26 m. The boreholes were drilled under the constant supervision of our geotechnical field supervisors, either Mr. Kevin Simoneau or Mr. Alex Tremblay.

Rock core samples were examined on site and RQD (*Rock Quality Designation*) and TCR (*Total Core Recovery*) values were measured for every core run. The borehole logs can be consulted in Appendix 1. The following table shows the location of the boreholes, depths reached, and corresponding survey elevations.

The rock core samples were all brought back in core boxes to Qualitas office for further laboratory testing. As mentioned previously, soil samples were also brought back for this purpose.

Table 1 Borehole locations and depths						
Borehole No.	Coordinates UTM 19 NAD 83		Date	Elevation of surface (m)	Elevation of bedrock (m)	Total depth (m)
	Eastern	Northing				
BH15-TMF-01	555186.84	5453296.58	2015-10-07	80.45	80.37	7.67
BH15-TMF-02	554941.85	5453130.93	2015-10-11	77.71	75.42	9.26
BH15-TMF-03	554943.01	5453294.67	2015-10-10	79.43	79.13	7.60
BH15-TMF-04	555091.31	5453373.65	2015-10-09	84.84	84.64	7.51

2.4 TEST PITS

A total of 18 test pits were excavated with a Komatsu PC138 hydraulic excavator on the TMF area. The test pits aimed to check the stratigraphy and to confirm the depth and the dip of the bedrock. The test pits were carried out under the supervision of Mr. Simoneau or Mr. Tremblay, of Qualitas, and dug at depths between 0.05 and 3.50 metres. Samples were collected inside the test pits for laboratory examination and further laboratory testing. The following table shows the location of the test pits, depths reached, and corresponding surveyed elevations.

Table 2 Test pit locations and depths						
Test pit No.	Coordinates UTM 19 NAD 83		Date	Elevation of surface (m)	Elevation of bedrock at survey location (m)	Total depth (m)
	Eastern	Northing				
TP15-TMF-01	555200.96	5453400.12	2015-10-15	87.57	87.47	0.10
TP15-TMF-02	555169.94	5453247.23	2015-10-07	81.82	81.72	0.10
TP15-TMF-03	555162.76	5453204.17	2015-10-08	81.14	81.09	0.05
TP15-TMF-04	555147.03	5453142.03	2015-10-08	80.28	80.18	0.10
TP15-TMF-05	555110.96	5453072.25	2015-10-08	81.24	81.14	0.10
TP15-TMF-06	555059.99	5453089.74	2015-10-08	78.66	77.96	0.70 ⁽¹⁾
TP15-TMF-07	554998.19	5453109.19	2015-10-08	79.02	78.92	0.10 ⁽¹⁾

Table 2 Test pit locations and depths						
Test pit No.	Coordinates UTM 19 NAD 83		Date	Elevation of surface (m)	Elevation of bedrock at survey location (m)	Total depth (m)
	Eastern	Northing				
TP15-TMF-08	554887.31	5453156.40	2015-10-08	82.98	82.78	0.20
TP15-TMF-09	554920.25	5453233.81	2015-10-08	79.79	79.29	0.50
TP15-TMF-10	554961.19	5453340.50	2015-10-08	79.80	78.50	1.30
TP15-TMF-11	554982.69	5453392.53	2015-10-15	85.27	85.07	0.20
TP15-TMF-12	555005.44	5453453.46	2015-10-15	87.44	87.04	0.40
TP15-TMF-13	555069.55	5453456.44	2015-10-15	81.74	80.44	1.30
TP15-TMF-14	555129.83	5453453.27	2015-10-15	83.18	82.58	0.60 ⁽¹⁾
TP15-TMF-15	555182.48	5453454.88	2015-10-15	86.69	86.49	0.20
TP15-TMF-16	555265.18	5453398.39	2015-10-15	84.05	83.75	0.30
TP15-TMF-17	555266.76	5453249.23	2015-10-15	79.41	75.91	3.50
TP15-TMF-18	555315.54	5453134.67	2015-10-15	78.72	77.52	1.20

Note :
1 Step-like bedrock dip. See drawing in Appendix 1 for further details.

The test pit logs are presented in Appendix 1, following the borehole logs.

2.5 GEOLOGICAL MAPPING

A geological mapping was realized along the alignment of the cells of the projected TMF by Mr. Simoneau. The geological mapping included the following items:

- Description of the physical environment;
- Important landscape features such as outcrops and streams;
- Note of erratic elements, such as boulders;
- Description of peat bogs in detail;
- Note of erosion, risk of instability, or rock falls.

A companion photographic report is presented in Appendix 6 to be consulted alongside the geological map (drawing 632622.2-02).

2.6 PRESSURIZED WATER TEST (PACKER TEST)

Pressurized water tests (Lugeon type) were conducted at shallow depths in the bedrock, in every borehole for a total of 12 packer tests. These tests are used to evaluate the permeability of joints present at low depth in the rock mass.

Lugeon tests were performed with a double packer system. The straddle system was composed of two 1.0-m-long, 57-mm diameter, inflatable steel lined rubber packers with an interval of 1.90 m between the packers (injection zone). The packers and the hose were lowered into the hole using the winch of the drill rig.

Note that a single packer (simple packer test) was used to test the bottom section of the boreholes.

In the water injection phase, the pressure was measured with a surface gauge positioned between 0.78 and 1.10 m above the ground surface. The injection rate was measured at the surface using a mechanical flowmeter.

Following these operations, packer tests were performed in the holes at selected depth intervals.

The tests were carried out according to the following general procedure:

1. Prior to testing, the packer system is tested at the surface inside a casing to ensure there is no leakage and that the equipment is working properly;
2. Installation on the test interval;
3. Saturation of the injection line and borehole cleaning before each test;
4. Packer inflation at approximately 2 MPa of internal pressure (approximately 1 MPa higher than maximum test pressure to ensure there is no leakage);
5. Measurement of total water flow injected every minute for at least 5 minutes or until stable. Repeat test for each ascending step at $0.3P_{\max}$ (step 1), $0.6P_{\max}$ (step 2), P_{\max} (step 3) and decreasing step at $0.6P_{\max}$ (step 5), and $0.3P_{\max}$ (step 6). In case the flow rate is null for the first 3 steps, the test can be stopped at P_{\max} (step 3) as it is logical to assume that there will be no flow at lower pressure. Also, steps were skipped when the minimum applied pressure (corresponding to the height of the water column over the interval) exceeded the testing pressure;
6. Deflate packer and move to the next test interval.

The maximum pressure allowed in the interval is usually calculated by using an underestimated weight for the overburden and the rock above the interval to avoid unwanted hydrojacking. For this site, values of 15 kPa/m were considered for the overburden and 25 kPa/m, for the rock.

Lugeon tests were carried out using method NF P94-31 from the *Société d'énergie de la Baie-James* (SEBJ) as suggested in Hatch's *Summary of Work* document. All pressure gauges and flowmeters were verified at Qualitas prior the fieldwork.

The permeability test results are given in section 3.2.2. Interpretation sheets for the tests are provided in Appendix 3.

2.7 BOREHOLE INSTRUMENTATION

The four boreholes were instrumented to monitor groundwater level variation with monitoring wells in boreholes BH15-TMF-01, BH15-TMF-03 and BH-15-TMF-04 and with a Casagrande piezometer in borehole BH15-TMF-02.

The monitoring wells were built using PVC casings (schedule 40) of 38 mm in exterior diameter, fitted with a 3.0 to 6.0 m-long slotted screen section at the bottom. The slotted screen PVC section rests directly at the bottom of the borehole. The annular space between the borehole wall and the PVC casing was filled with silica sand, including the slotted screen section. The monitoring well was then sealed at the rock/overburden contact (usually corresponding more or less with the top of the borehole) with a bentonite plug to isolate the bedrock groundwater from any surface water infiltrations. At the request of Hatch, a second bentonite seal was put in place directly above the screen section in boreholes BH15-TMF-03 and BH15-TMF-04.

The Casagrande piezometer was built using a porous cell of 0.3 m fitted with a 19 mm PVC casing. The annular space between the borehole wall and the porous cell was also filled with silica sand. The piezometer was first sealed at with a bentonite plug at the top of the porous cell and a second one at the ground surface.

A steel protective casing fitted with a lockable aluminum lid was installed to cover and protect the entire above-ground PVC section of the monitoring wells and the Casagrande piezometer.

The monitoring wells installation details are presented in Appendix 1, in the corresponding borehole logs. Groundwater depths are presented in section 3.2.1 of this report.

2.8 PERMEABILITY TEST (SLUG TEST)

Permeability tests (slug tests) were carried out in boreholes BH15-TMF-02 to BH15-TMF-04 according to the BNQ standard no. 2501-135. The tests were realized in the monitoring well installed in the rock for boreholes BH15-TMF-03 and BH15-TMF-04 or in the piezometer installed in the overburden in borehole BH15-TMF-02.

Pressure transducer (Levellogger Edge LT M5/FT15 from *Solinst*) was installed in boreholes BH15-TMF-03 and BH-15-TMF-04 to monitor groundwater level fluctuations during the slug-test. All data logger were set to a sampling interval of two seconds. On October 17th 2015, it was installed in the tested monitoring well, hanging at the end of a kevlar rope attached to a vented cap at the top of the PVC casing. A data logger barometer (Barologger Edge from *Solinst*) was also installed next to the monitoring well, to compensate the Levellogger readings for variations of the atmospheric pressure.

In borehole BH15-TMF-02, the water levels were manually surveyed during the slug test since 19-mm-diameter standpipe was too narrow to fit the Levellogger.

The tests were carried out according to the following procedure:

- i- The equilibrium water level is raised by injecting a volume of water (falling-head test);
- ii- Water level versus time is monitored throughout the test with a data logging pressure transducer (*Solinst* Levellogger) or manually with a water level probe until the water level reverts to the equilibrium value (or next to it);

The permeability test results are given in section 3.3.3. Interpretation sheets for the tests are provided in Appendix 4.

2.9 GEODETIC SURVEY

Every test location was positioned on the field during the initial visit by our field supervisor using a Trimble GPS model GEO 7 using the Global Navigation Satellite System (GNSS) technology, with a precision of ± 0.050 metres in X and Y coordinates

and 0.075 metres in Z coordinate (geodesic elevation). The benchmark used as a reference to survey the elevation of the test location was provided by a project carried in 2013 by the ministère des Transports du Québec: *Amélioration de la route 389 du ministère des Transports du Québec*. The specifications of the benchmark are provided in Appendix.

The test coordinates were those specified by Hatch for the TMF area on the drawing titled: *Preliminary geotechnical Investigation – ACP3009 Tailing Management Facility (TMF)* (Document No H347199-0000-15-042-0003, Rev. 0, dated August 27th, 2015). After the field work was completed, the sounding locations were surveyed by RCI's surveyors using a Trimble GPS model R8 using the GNSS technology (precision of \pm 0.008 metres in X and Y coordinates and 0.015 metres in Z coordinate). The coordinates shown in Tables 1 and 2 refers to the UTM NAD 83 (Zone 19) coordinates system.

2.10 PETROGRAPHIC AND GEOMECHANICAL DESCRIPTION

A geological (petrographic) and geomechanical description of the rock cores was performed by Mr. Alexandre Aubin, geological engineer of Qualitas. The detailed geological description of the cores can be found in the borehole logs in Appendix I. In addition to this description, the TCR (*Total Core Recovery*) and RQD (*Rock Quality Designation*) were measured for every drilling runs.

The complete geomechanical description tables are shown in Appendix 1, following the core pictures (dry and wet) of the drilled rock in each borehole.

2.11 LABORATORY TESTING

Soil and rock core samples were collected by the field inspector in the geotechnical boreholes and the test pits carried in the course of this mandate.

At the end of the field work, all the collected soil and rock core samples were brought back to Qualitas' laboratories in Jonquiere and Baie-Comeau, to be described and classified.

Laboratory tests were performed on selected soil and rock core samples to determine their geotechnical and geomechanical properties, respectively. The soil and rock laboratory testing program was decided in conjunction with Hatch.

The laboratory testing program for soil and rock core samples is presented in Table 3.

Table 3 Soil and rock core laboratory testing		
Soil sample test	Corresponding standard	Quantity
Moisture Content	BNQ 2501-170	2
Grain Size Distribution (Sieve Method)	LC 21-040	3
Grain Size Distribution (Hydrometer Method)	BNQ 2501-025	3
Atterberg Limits	BNQ 2501-092	2
Rock core test	Corresponding standard	Quantity
Unit Weight	--	5
Uniaxial Compressive Strength	ASTM D 7012	3
Indirect Tensile Strength (Brazilian Test)	ASTM D 6921	2

The soil tests were conducted either at Qualitas' laboratory in Jonquiere or in Baie-Comeau while all of the rock core tests were conducted in Jonquiere. Results of all tests are shown in the logs in Appendix 1 and in Appendix 2.

The grain size distribution curves of 3 selected soil samples are shown in Figure 2.1 of Appendix 2.

Note that samples that were not used for the laboratory tests will be stored for a period of one year after this report is published. Once this one year period has elapsed, the samples will be destroyed unless directed otherwise by the client or his consultant.

3.0 RESULTS

3.1 STRATIGRAPHY AND LITHOLOGY

Stratigraphy and lithology interpretation and the soil and rock properties are based on drilling and test pits results and on laboratory tests carried out in this mandate. Subsequent sections describe the stratigraphic layers or lithologies encountered in the boreholes and trenches in order of increasing depth. Subsurface conditions encountered at specific locations are shown on the logs enclosed in Appendix 1 and are discussed below.

3.1.1 Overburden

In the following sections, the soil description has been interpreted and simplified to major strata for the purpose of geotechnical analysis.

The overburden was sampled in the 4 boreholes (BH15-TMF-01 to BH15-TMF-04) and 18 test pits (TP15-TMF-01 to TP15-TMF-18).

3.1.1.1 Surficial layer

An organic layer was encountered in all of the soundings except BH15-TMF-02. The surficial layer of dark brown organics is approximately 0.05 to 2.50 m thick. The organic layer is composed of moss, roots, wood debris and other organics. Cobbles and boulders (maximum diameter of 0.80 m) were observed in volumetric proportions of 2-5% and 2%, respectively.

A 0.51-m thick surficial layer of peat was encountered in borehole BH15-TMF-02. The peat layer has a dark brown color and is classified H3 (very little decomposition) according to the Von Post classification system

3.1.1.2 Clay deposit

A clay deposit was encountered next to boreholes BH15-TMF-02 directly under the peat layer and in test pits TP15-TMF-06, TP15-TMF-10, TP15-TMF-13 and TP15-TMF-17. The thickness of the clay deposit ranges from 0.20 to 1.32 m. The clay deposit is mainly composed of silty grey clay with traces to some sand. The clay deposit is homogenous.

Two grain size analyses were realized on that type of material and yield the following results (see grain size distribution curve in Figure 2.1 of Appendix 2):

- Clay content : 30 to 36 %;
- Silt content : 54 to 55 %;
- Sand content : 9 to 16 %;
- Gravel content : 0 %.

Some clay samples collected during the field work were submitted to geotechnical laboratory testing. The Atterberg limits were determined for two samples representative of the clay deposit. The test results are presented in the test pit logs of Appendix 1, in figure 2.2 of Appendix 2 and in the following Table 4.

Table 4 Characteristics on the clay deposit									
Sounding No.	Sample No.	Depth (m)		Water content w (%)	Atterberg limits				ASTM D 2487 Classification
		From	To		Plastic limit w _P (%)	Liquid limit w _L (%)	Plasticity index I _p (%)	Liquidity index I _L (%)	
BH15-TMF-02	CF-3	1.22	1.83	31	19	32	13	0.9	CL
TP15-TMF-17	MA-6	2.50	3.00	25	19	33	14	0.4	CL

According to the USCS plasticity chart, this material is a silty clay of medium plasticity (CL).

The consistency of this deposit is deemed very soft to soft in borehole BH15-TMF-02.

3.1.1.3 Silty sand deposit

Under the clay deposit lies a deposit composed of silty sand with traces of gravel of 0.45 m in thickness next to BH15-TMF-02. No sample of this material was submitted to laboratory testing.

A single N value of 8 blows per 300 mm of penetration was measured in the silty sand layer in borehole BH15-TMF-02, indicating a deposit with a loose compactness.

3.1.1.4 Sand some gravel and silt

Under the organic layer in test pits TP15-TMF-14 and TP15-TMF-18, lies a 0.10 to 0.40 m-thick sand deposit with some gravel, traces to some silt and traces of clay.

One grain size analysis was realized on that type of material and yielded the following results (see grain size distribution curve in Figure 2.1 of Appendix 2):

- Clay content : 2 %;
- Silt content : 16 %;
- Sand content : 65 %;
- Gravel content : 17 %.

3.1.2 Bedrock

The bedrock in the TMF area is often very shallow and covered only by a centimetric layer of organics. Bedrock elevation in the soundings ranges from 75.42 to 80.37 m. The geology of the bedrock is similar from one borehole to another. The percentage of the various minerals is estimated visually from the rock core to give a general idea and it may vary from laboratory analyses. Note that the results of laboratory tests on the rock samples are presented in the borehole logs in Appendix 1.

The rock was cored in lengths ranging from 6.97 to 7.59 m.

3.1.2.1 Petrographic description

Bedrock features noted during core logging were color, composition, textures and structures. The rock was named on the basis of these observations.

The following Table 5 is a summary of the geological description of the bedrock encountered next to each of the four boreholes.

Table 5 Geological description				
Borehole no.	From (m)	To (m)	Lithology	Description
BH15-TMF-01	0.08	7.67	Granite	Massive and coarsely grained pinkish grey rock composed of quartz and feldspar with disseminated biotite chunks.
BH15-TMF-02	2.29	9.26	Garnet bearing granitic gneiss	Composed of biotite, feldspar and quartz with garnet porphyries. Grey to greenish grey rock. Fine to medium grains. Lightly carbonated. Intensely foliated (Foliation from 40 to 45° TCA).
BH15-TMF-03	0.30	7.60	Garnet bearing granitic gneiss	Composed of biotite, feldspar and quartz with garnet porphyries. Grey to greenish grey rock. Medium grains. Lightly carbonated. Intensely foliated (Foliation from 70 to 75° TCA)
BH15-TMF-04	0.05	0.20	Granitic gneiss	Grey to greenish grey rock. Fine to medium grains. Intensely foliated (Foliation at 80° TCA). Lower contact 60° TCA.
	0.20	7.51	Granite	Massive and coarsely grained pinkish grey rock composed of quartz and feldspar with disseminated biotite chunks.
<p>Note : TCA: To core axis</p>				

3.1.2.2 Individual Joints Description

Geomechanical parameters of individual joints were described during core logging. These parameters are: Depth, Core Angle, Roughness, Infilling types and Hardness, Coating plus Weathering. The description table of individual joint is presented in Appendix 1.

Joints were numbered and compiled according to three ranges of orientation: 0 to 30° TCA (Sub-vertical joints), 30 to 60° TCA (Inclined joints) and 60 to 90° TCA (Sub-horizontal joints). An averaged joint density and an apparent spacing were calculated from the total number of joints. Results are presented in the following Table 6:

Table 6 Number and Core Angle of Joints								
Borehole no.	From (m)	To (m)	Core angle range				Average joint density (joints per metre)	Apparent spacing (mm)
			0-30° TCA Sub-vertical	30-60° TCA Inclined	60-90° TCA Sub-horizontal	Total		
BH15-TMF-01	0.08	7.67	7	8	13	28	3.7	271.1
BH15-TMF-02	2.29	9.26	11	10	16	37	5.3	188.4
BH15-TMF-03	0.30	7.60	0	2	23	25	3.4	292.0
BH15-TMF-04	0.05	7.51	6	3	24	33	4.4	226.1

3.1.2.3 Laboratory testing

Some core samples, selected in collaboration with Hatch, were submitted to laboratory testing to determine the uniaxial compressive strength and/or the indirect tensile strength (Brazilian test). The results are presented in the following Table 7 and in the borehole logs presented in Appendix 1.

Table 7 Bedrock properties based on laboratory testing						
Borehole no.	From (m)	To (m)	Lithology	Unit weight (kN/m ³)	Uniaxial compressive strength, q _u (MPa)	Indirect tensile strength, T ₀ (MPa)
BH15-TMF-01	0.66	0.75	Granite	25.7	76	--
	1.04	1.08	Granite		--	4.4
	1.31	1.35	Granite		--	7.5
BH15-TMF-04	0.99	1.08	Granite	25.4	125	--
	7.39	7.48	Granite		109	--

With an average uniaxial compressive strength of 100 MPa, this rock fall into the R4 grade (Strong) of Hoek & Brown' scale of rock resistance, as shown in Table 3.5 of the Manuel Canadien d'Ingénierie des Fondations of the Canadian Geotechnical Society, edited in 2013.

3.1.2.4 Rock Mass Classification

The classification used to assess the geomechanical quality of the rock mass is the Rock Mass Rating (RMR)².

The parameters considered in the RMR calculation are the strength of intact rock, the quality of the rock, the spacing and the condition of discontinuities, and the groundwater condition.

The RMR rating equation is:

$$\text{RMR (0-100)} = A1 + A2 + A3 + A4 + A5$$

Where :

A1 : rate for the strength of intact rock (ranging between 0 to 15)

A2 : rate for the drill core quality (RQD) (ranging between 0 to 20)

A3 : rate for spacing of discontinuities (ranging between 0 to 20)

A4 : rate for condition of discontinuities (ranging between 0 to 30)

A5 : rate for groundwater condition (ranging between 0 to 15)

² Bieniawski, Z.T. 1989. *Engineering rock mass classifications*. New York: Wiley.

The RMR ranges from 0 to 100 with the corresponding rock qualities:

- 0 to 20 : very poor rock;
- 21 to 40 : poor rock;
- 41 to 60 : fair rock;
- 61 to 80 : good rock;
- 81 to 100 : very good rock.

The criteria used to evaluate each parameter are described in the following Table 8:

Table 8 Parameters of the Rock Mass Rating Classification			
Parameter		Maximum corresponding value	Criteria
A1	Strength of intact rock	15	Based upon the uniaxial compressive strength measured by laboratory testing.
A2	Rock Quality Designation	20	RQD measured while core logging.
A3	Spacing of discontinuities	20	Apparent spacing based of the number of joints along a core length.
A4 – Conditions of discontinuities	A4a	Persistence	6 Cannot be determined directly by boreholes investigation. A conservative rate of 2 was applied which represents a persistence form 3 to 10 m.
	A4b	Aperture	6 Joint aperture has been approximate on the basis of the core length recovery measured during core logging.
	A4c	Roughness	6 Rate based on the condition of the less favorable joint.
	A4d	Infilling	6 Rate based on the condition of the less favorable joint.
	A4e	Weathering	6 Rate based on the condition of the less favorable joint.
A5	Groundwater	15	Dry Condition.

The RMR evaluated for each borehole drilled at the TMF area is presented within the following Table 9:

Table 9 Rock Mass Rating (RMR)					
Borehole no.	From	To	Rating (Dry)	Rock Quality	Description
BH15-TMF-01	0.08	7.67	60	Fair	Joint conditions parameters are restricted by the possible open joint at 0.63 m.
BH15-TMF-02	2.29	9.26	54	Fair	RMR is restricted by fractured zones at 2.55 m and 6.12 m.
BH15-TMF-03	0.30	7.60	60	Fair	RMR is restricted by the possible open joint at 1.41 m.
BH15-TMF-04	0.05	7.51	61	Fair/Good	RMR is restricted by the possible open joint at 0.89 m and the partially open joint at 2.35 m.

The RMR value is defined by the worst joint conditions occurring in the interval of the rock mass. Usually the bedrock encountered in the four boreholes is a good quality, moderately fractured rock with poor joint conditions. Some open joint are suspected next to borehole BH15-TMF-01, BH15-TMF-03 and BH15-TMF-04. Since the joint condition criterion bears important weight in the RMR calculation (30 %), poor joint conditions lower significantly the RMR value. Also note that the cored rock sections are at subsurface (maximum depth of 9.26 m) where increased fracturing is anticipated due to frost action and weathering, for example.

Details of the RMR calculation for each borehole are presented in Table 2 in Appendix 1, following the borehole and the test pit logs.

3.1.2.5 Borehole Lithology and rock quality

Borehole BH15-TMF-01

The bedrock intersected in borehole BH15-TMF-01 from 0.08 m to the bottom of hole at 7.67 m is composed of a pinkish grey massive and coarsely grained granite. This rock is composed mainly of quartz and feldspar with presence of biotite aggregates.

The rock is generally weakly fractured, with an average joint density of 3.7 joints per metre. About half of the described joints are sub-horizontal (core angle from 60 to 90° TCA). A possible open joint is suspected at 0.63 m.

Based on the RMR classification, the rock quality is fair (rating of 60). The joint conditions parameter for the RMR classification suffered from the possible sub-horizontal open joint observed at 0.63 m.

Borehole BH15-TMF-02

In borehole BH15-TMF-02, the bedrock was intersected from 2.29 m all along the drilled depth of 9.26 m and is composed of a garnet bearing granitic gneiss. This grey to greenish grey rock is composed of biotite, feldspar and quartz with garnet porphyries. The grains are fine to medium sized and the rock is lightly carbonated. An intensely developed foliation is visible with a 40 to 45° TCA attitude.

The rock is generally lightly fractured, with an averaged joint density of 5.3 joints per meter. About half of the described joints are sub-horizontal (core angle from 60 to 90° TCA). Two fractured zones were observed at 2.55 and 6.12 m. The thickness of the fractured zone at 2.55 m is 250 mm and its walls are coated with chlorite and calcite. The fractured zone at 6.12 m is approximately 70-mm thick and no infilling nor coating were observed.

Based on the RMR Classification, the rock quality is fair (rating of 54) and is penalized by conditions of fractured zones.

Borehole BH15-TMF-03

The bedrock was intersected at 0.30 m and is composed of a garnet bearing gneiss all along the drilled depth of 7.60 m. This grey to greenish grey rock is composed of biotite, feldspar, and quartz with garnet porphyries. It is composed of medium grains and is lightly carbonated. A foliation, inclined from 70 to 75° TCA, is intensely developed.

The rock is generally weakly fractured, with an average joint density of 3.4 joints per metre. The majority of the described joints are sub-horizontal (core angle at 60 to 90° TCA). A possible open joint is suspected at 1.41 m in depth with an aperture of 10 mm and walls thinly coated with limonite.

Based on the RMR Classification, the rock quality is fair (rating of 60). The rating is penalized by the presence of a possible open joint.

Borehole BH15-TMF-04

The bedrock was intersected at 0.05 m. A gneiss is found from 0.05 to 0.20 m. The gneiss is in contact with a granite, with a 60° angle TCA.

The grey gneiss has medium grains and is composed of biotite, feldspar and quartz. An intense foliation is developed at 80° TCA.

The granite is pinkish grey. It is massive, coarsely grained and composed of mostly quartz and feldspar with disseminated chunks of biotite.

The rock is generally gently fractured, with an average joint density of 4.4 joints per metre. The majority of described joints are sub-horizontal (core angle from 60 to 90° TCA).

Open joints are suspected at depths of 0.89 m, 2.11 m and 2.17 m. The infilling material of the open joints was not identified but some walls were coated with limonite.

A partially open joint is suspected at 2.35 m in depth. This joint is filled with weathered and decomposed rock.

Based on the RMR Classification, the Rock Quality is fair to good (rating of 61). The rock quality rating suffers from the presence of possible open and partially open joints.

3.2 GROUNDWATER CONDITIONS

3.2.1 Groundwater levels

Groundwater levels were measured at every borehole location and are presented in the following Table 10.

Table 10 Water level measurements in the boreholes						
Borehole No.	Elevation of surface (m)	Date of measurement	Water level measurement reference	Height of the reference above-ground (m)	Water level ⁽¹⁾ (m)	Corresponding water level elevation (m)
BH15-TMF-01	80.45	2015-10-17	Top of PVC casing	1.05	1.56	79.94
BH15-TMF-02	77.71	2015-10-17	Top of PVC casing	1.15	1.22	77.64
BH15-TMF-03	79.43	2015-10-17	Top of PVC casing	1.17	1.36	79.24
BH15-TMF-04	84.84	2015-10-17	Top of PVC casing	0.99	3.43	82.40

Note :
1 Referring to the water level measured from the top of the PVC casing.

According to the piezometric elevations measured in the bedrock, the groundwater flow direction is oriented heading South-West.

It should be noted that groundwater levels can change according to climatic conditions and that they are subjected to seasonal variations.

3.2.2 Hydraulic Conductivity (Lugeon test)

The Lugeon tests were interpreted using the method proposed by Houlby (1976)³ and updated by Quinones-Rozo (2010)⁴. The formula used to compute the Lugeon value for each test was:

$$L = \frac{Q}{P_e * l} \quad \text{eq.1}$$

Where :

- L = Lugeon value
- Q = Flow rate in l/min
- P_e = Effective overpressure in kPa
- L = Length of the interval in metres

Note that the effective overpressure is the water head exceeding the hydrostatic pressure inside the test cell. Due to time limitations, it was not usually possible to let the pressure inside the interval reach equilibrium conditions before the test began. The hydrostatic pressure considered in the calculation was therefore that of the open full-length borehole measured before the tests. Also, since the tests were performed at very shallow depth, it was often not possible to carry out the low pressure stages of the tests because the pressure head from the interval to the surface was already higher than the required test pressure without any effort from the pump. The lowest possible pressure is the height of the water column from the test interval to the gauge which was already higher than 33% of the maximum test pressure. When that was the case we either carried out the test at the lowest allowable pressure or skipped the stage altogether.

The summary results for each borehole and the results of every test are presented in the following Table 11 and in Appendix 3. Q vs P_e plots for each test are also presented

³ Houlby, A. (1976). Routine interpretation of the Lugeon Water-Test. Q.J. Eng. Geol. Vol. 9, pp. 303-313

⁴ Quiñones-Rozo, Camilo (2010). Lugeon test interpretation, revisited. Collaborative Management of Integrated Watersheds, US Society of Dams, 30th Annual Conference, S. 405–414.

to determine the behaviour of the test. For each plot, the flow rate vs. pressure pattern was used to determine the representative Lugeon value.

Table 11 Hydraulic Conductivity results (Lugeon test)					
Borehole No.	Test interval		Behavior	Representative Lugeon value	Conductivity (cm/s)
	From	To			
BH15-TMF-01	2.37	4.27	Very tight rock	0.0	0.00E0
	4.27	6.17	Very tight rock	0.0	0.00E0
	6.17	7.67	Very tight rock	0.0	0.00E0
BH15-TMF-02	3.39	5.29	Very tight rock	0.0	0.00E0
	5.29	6.19	Dilatation	21.6	1.78E-4
	7.19	9.26	Dilatation	7.0	7.29E-5
BH15-TMF-03	1.40	3.30	Very tight rock	0.0	0.00E0
	3.30	5.20	Very tight rock	0.0	0.00E0
	5.20	7.60	Very tight rock	0.0	0.00E0
BH15-TMF-04	1.15	3.05	Dilatation	0.00	0.00E0
	3.05	4.95	Very tight rock	0.0	0.00E0
	4.95	7.51	Very tight rock	0.0	0.00E0

Generally, out of all the test results the behaviour of the rock mass is mostly impermeable (8 out of the 12 tests have a very tight rock behavior) i.e. the Lugeon values are null.

The Lugeon tests conducted in the context of this investigation allowed us to evaluate the hydraulic conductivity of the bedrock using AquiferTest 2014.1 version 4.6.0.2 software by Schlumberger Water Services. The hydraulic conductivity values obtained for the bedrock varies from $1.00E-5$ cm/sec (very tight rock) to $1.78E-4$ cm/sec (few partly open discontinuities).

3.2.3 Hydraulic Conductivity (Slug test)

The slug tests conducted in the context of this investigation allowed us to evaluate the hydraulic conductivity of the surficial deposit and of the shallow bedrock using AquiferTest software. The analysis is based on assumptions from Hvorslev's method.

The hydraulic conductivity values obtained for the surficial deposit in borehole BH15-TMF-02 is 6.80E-3 cm/sec. In the bedrock, the hydraulic conductivity from the falling head slug tests varies from 4.94E-5 to 5.78E-3 cm/sec. Permeability test results are shown in Table 12 while the plot results for each borehole are presented in Appendix 3.

Table 12				
Hydraulic Conductivity results (Slug test)				
Borehole no.	Stratigraphy or Lithology	Date	Test No. 1	
			Type	Hydraulic Conductivity (cm/sec)
BH15-TMF-02	Silty sand	2015-10-17	falling-head	6.80E-3
BH15-TMF-03	Gneiss	2015-10-17	falling-head	4.94E-5
BH15-TMF-04	Granite	2015-10-17	falling-head	5.78E-3

3.2.4 Lugeon test results versus Slug test results

A variation between the hydraulic conductivity measured with the Packer test and the Slug test method is predictable and explainable. As mentioned previously, the Lugeon tests were interpreted using the proposed Houlsby (1976) method. The selected representative Lugeon value of a tested interval depends on the observed behavior during packer tests at different pressure stages. Slug tests are carried out by raising and/or lowering the water level in a well and can be interpreted with various methods (in the present case, Hvorslev's). These are two completely different approaches. Furthermore, the lugeon tests measures hydraulic conductivity on a definite interval of approximately 1.5 m while the hydraulic conductivity determined with the slug tests is representative of the rock mass surrounding the screen section of the well.

APPENDIX 1

EXPLANATORY NOTES ON BOREHOLE AND TEST PIT LOG AND
BOREHOLE AND TEST PIT LOGS

TABLE 1.1: DESCRIPTION OF INDIVIDUAL JOINTS

TABLE 1. 2: ROCK MASS RATING DETAILS

EXPLANATORY NOTES

BOREHOLE AND TEST PIT LOG

(page 1 of 2)

The object of the borehole and test pit log is to present field and laboratory data concerning soil, bedrock and groundwater conditions. The purpose of this note is to explain the terminology, symbols and abbreviations used on the log.

STRATIGRAPHY

1. DEPTH - ELEVATION

The depth and elevation of contacts between the various geological strata are given in relation to the ground surface at the borehole or test pit location. Elevations refer to a datum as specified in the general heading of the log.

2. SOIL DESCRIPTION

Soils are described according to their physical and geotechnical properties.

Soil particle size classification is given below:

<u>IDENTIFICATION</u>	<u>PARTICLE SIZE (mm)</u>
Clay	< 0.002
Silt	0.002 - 0.08
Sand	0.08 - 5
Gravel	5 - 80
Cobble	80 - 300
Boulder	> 300

The proportion of each soil constituent, as identified by the particle size range, is defined by the following descriptive terms:

<u>DESCRIPTION</u>	<u>PARTICLE SIZE FRACTION (%)</u>
Trace	1 - 10
Some	10 - 20
Adjective (ex.: sandy silt, silty)	20 - 35
And (ex.: sand and gravel)	> 35

2.1 STATE OF COMPACTNESS OF COHESIONLESS SOILS

The state of compactness of cohesionless soils is evaluated using the "N-value" obtained during the Standard Penetration Test (SPT).

<u>COMPACTNESS</u>	<u>N-VALUE (blows / 300 mm)</u>
Very loose	< 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very dense	> 50

2.2 CONSISTENCY AND PLASTICITY OF COHESIVE SOIL

The consistency of cohesive soils is defined by the undrained shear strength. The undrained shear strength of the intact clay (s_u) and remoulded clay (s_r) is measured in situ or in the laboratory.

<u>CONSISTENCY</u>	<u>UNDRAINED SHEAR STRENGTH, s_u (kPa)</u>
Very soft	< 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very stiff	100 - 200
Hard	> 200

<u>DEGREE OF PLASTICITY</u>	<u>LIQUID LIMIT, w_L (%)</u>
Low	< 30
Medium	30 - 50
High	> 50

3. ROCK DESCRIPTION

Rock is described according to its geological origin, composition, structural characteristics and mechanical properties.

The Rock Quality Designation (RQD) is determined according to the ASTM D 6032 Standard.

<u>CLASSIFICATION</u>	<u>RQD VALUE (%)</u>
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

<u>JOINT SPACING CLASSIFICATION</u>	<u>SPACING WIDTH (mm)</u>
Extremely close	0 - 60
Close	60 - 200
Moderately close	200 - 600
Wide	600 - 2000
Very wide	> 2000

<u>STRENGTH</u>	<u>UNCONFINED COMPRESSIVE STRENGTH, q_u (MPa)</u>
Extremely weak	< 1
Very weak	1 - 5
Weak	5 - 25
Medium strong	25 - 50
Strong	50 - 100
Very strong	100 - 250
Extremely strong	> 250

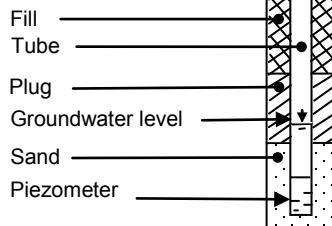
EXPLANATORY NOTES

BOREHOLE AND TEST PIT LOG

(page 2 of 2)

GROUNDWATER LEVEL

The column "Groundwater Level" gives the groundwater level measured in a stand pipe, piezometer, monitoring well or directly in the borehole or test pit. The survey date is also indicated in this column. The sketch opposite illustrates the different symbols used.



ABBREVIATIONS

A	Absorption, L/min-m (Packer Test in rock)
CA	Chemical analysis
C	Consolidation test
C _c	Curvature coefficient
C _U	Uniformity coefficient
s _u	Intact undrained shear strength, measured with the field vane, kPa
s _r	Remoulded undrained shear strength, measured with the field vane, kPa
s _{us}	Intact undrained shear strength, measured with the Swedish fall-cone, kPa
s _{rs}	Remoulded undrained shear strength, measured with the Swedish fall-cone, kPa
s _{up}	Intact undrained shear strength, measured with the portable vane apparatus, kPa
s _{rp}	Remoulded undrained shear strength, measured with the portable vane apparatus, kPa
D _r	Relative density
E _M	Pressuremeter modulus, kPa or MPa
G	Particle size distribution by sieve and washing
I _L	Liquidity index
I _p	Plasticity index, %
k _c	Coefficient of permeability (hydraulic conductivity), measured in situ, m/s
k _L	Coefficient of permeability (hydraulic conductivity), measured in the laboratory, m/s
N _{dc}	Dynamic cone penetrometer blow count (DCPT)
N	Standard penetration test (SPT) index
P ₈₀	Sieve analysis by washing on the 80 μm sieve
P _L	Pressuremeter limit pressure, kPa
P _r	Proctor Test
γ	Unit weight, kN/m ³
γ'	Effective unit weight, kN/m ³
q _u	Unconfined compressive strength of rock, MPa
R	Split spoon penetration refusal
S	Particle size distribution by hydrometer testing
S _t	Sensitivity (s _u /s _r)
CPV	Corrosivity point value
w	Water content, %
w _L	Liquid limit, %
w _p	Plastic limit, %

SAMPLES

1. TYPE AND NUMBER

The column "Type and Number" corresponds to the sample number. It includes 2 letters indicating the sample type followed by a sequence number. The sample types are as follows:

SS : Split spoon	RC : Rock core
LS : Large diameter sampler	GS : Grab sample
TW : Thin wall tube	AS : Auger sample
TU : Geoprobe™ sampling tube	

2. CONDITION

The depth, strength and condition of each sample is given in this column. The following symbols indicate the condition of the sample:



3. RECOVERY

Sample recovery corresponds to the recovered length of the sample in relation to the length of penetration of the sampler, expressed in percentage. The sample length is equal to the distance from the top of the sampler to the cutting edge whether or not the lower part of the sample is lost.

IN SITU AND LABORATORY TESTS

In situ and laboratory test results are indicated in the column "In Situ and Laboratory Tests" at the corresponding depth.

The following list of abbreviations identifies these tests.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH15-TMF-01
DATE : 2015-10-07
UTM COORDINATES : UTM 19 NAD83
E : 555186.84 **N** : 5453296.58

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES				IN SITU AND LABORATORY TESTS												
			TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%) W_p W_L W	OTHER TESTS	$\blacktriangle S_u$ (kPa) ∇S_{us} (kPa) $\star S_r$ (kPa) $\otimes S_{rs}$ (kPa) $\circ N_{dc}$ (blows/300 mm)										
									20	40	60	80							
0.08	80.45	Organic matter. Presence of roots.	MA-1		100														
1	80.37	Bedrock: granite. Massive and coarsely grained. Pinkish grey color. Composed of quartz and feldspar with disseminated biotite chunks.	CR-2		94	94													
2			CR-3		100	88													
3																			
4			CR-4		100	91													
5																			
6			CR-5		100	82													
7			CR-6		100	99													
7.67	72.78	End of borehole																	
8																			
9																			
10																			

COMMENTS:

DRILLING METHOD : CME-55 (Forage André Roy inc.)

F:\Geotec\80\S\w\proj\632622-LOG-BH15-TMF-01.dwg PLOTTED: 2015-10-09 15:20hrs

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau,
Quebec QUALITAS FILE NO : 632622

Borehole core pictures

BH15-TMF-01



Depth from 0.08 to 7.67 m (dry)



Depth from 0.08 to 7.67 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH15-TMF-02

DATE : 2015-10-11
UTM COORDINATES : UTM 19 NAD83
E : 554941.85 **N** : 5453130.93

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2015-10-17 77.64 m	SAMPLES			IN SITU AND LABORATORY TESTS												
				TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS	Soil Strength Parameters								
								w_p	w_L		w	S_u (kPa)	S_{us} (kPa)	S_r (kPa)	S_{rs} (kPa)	N_{dc} (blows/300 mm)			
	77.71																		
0.51	77.20	Dark brown peat layer (Von Post: H3).		CF-1	X	84	7												
1		Grey silty clay (CL) of medium plasticity, traces of sand. Consistency is deemed very soft to soft.		CF-2	X	66					N: weight								
1.83	75.88	Silty sand, traces of gravel.		CF-3	X	100	3	19	32	31	S								
2.29	75.42	Bedrock: granitic gneiss. Garnet bearing biotite, feldspar and quartz gneiss. Grey to greenish grey color. Fine to medium grains. Lightly carbonated. Intensely foliated (foliation oriented 40° to 45° TCA).		CF-4	X	22					N: 2-3-5-refus								
3				CR-5		73	65												
4				CR-6		99	95												
5				CR-7		93	81												
6				CR-8		100	93												
7				CR-9		100	92												
8																			
9																			
9.26	68.45	End of borehole																	

COMMENTS: TCA: to core axis.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau,
Quebec QUALITAS FILE NO : 632622

Borehole core pictures

BH15-TMF-02



Depth from 2.29 to 9.26 m (dry)



Depth from 2.29 to 9.26 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

BOREHOLE : BH15-TMF-03
DATE : 2015-10-10
UTM COORDINATES : UTM 19 NAD83
E : 554943.01 **N** : 5453294.67

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES				IN SITU AND LABORATORY TESTS						
			TYPE AND NUMBER	CONDITION	RECOVERY (%)	N or RQD (%)	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS				
							w_p	w_L		$\blacktriangle S_u$ (kPa) ∇S_{us} (kPa) $\star S_r$ (kPa) $\boxtimes S_{rs}$ (kPa) $\circ N_{dc}$ (blows/300 mm)			
20	40	60	80	20	40	60	80						
0.30	79.43	Organic matter. Presence of roots.	CF-1		33	3							
	79.13	Bedrock: granitic gneiss. Garnet bearing biotite, feldspar and quartz gneiss. Grey to greenish grey color. Mediumly grained. Lightly carbonated. Intensely foliated (foliation oriented 70° to 75° TCA).	CR-2		83	58							
			CR-3		97	79							
			CR-4		100	100							
			CR-5		100	91							
			CR-6		97	92							
			CR-7		99	99							
7.60	71.83	End of borehole											

COMMENTS: TCA: to core axis.

DRILLING METHOD : CME-55 (Forage André Roy inc.)

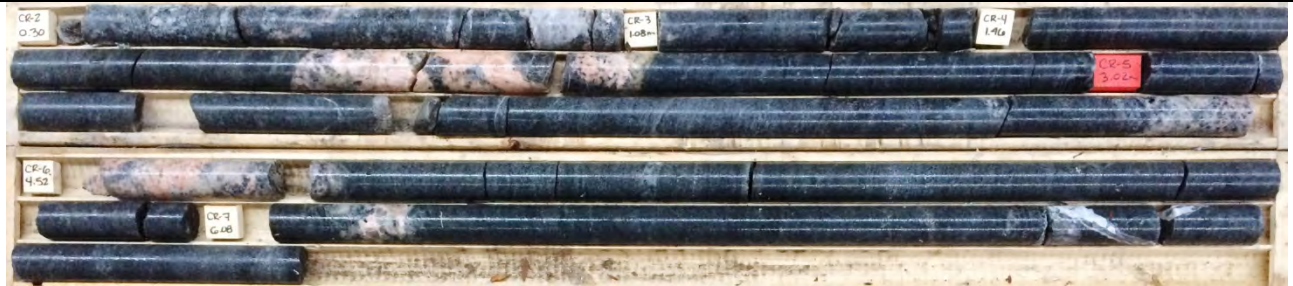
CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau,
Quebec QUALITAS FILE NO : 632622

Borehole core pictures

BH15-TMF-03



Depth from 0.30 to 7.60 m (dry)



Depth from 0.30 to 7.60 m (wet)

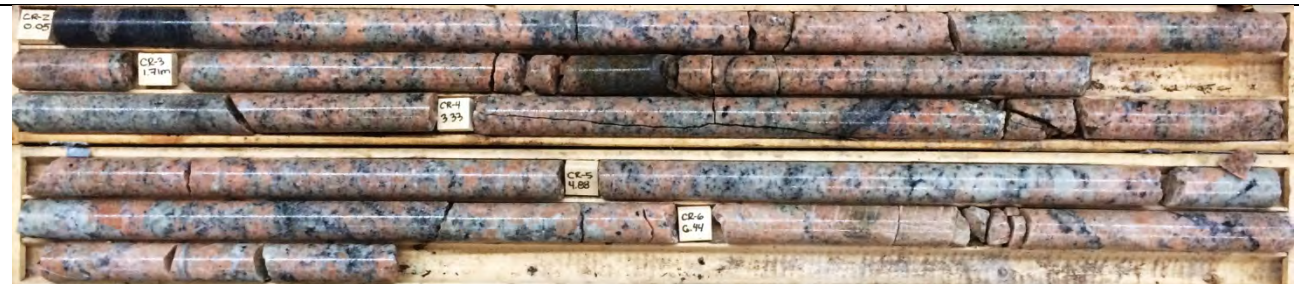
CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau,
Quebec QUALITAS FILE NO : 632622

Borehole core pictures

BH15-TMF-04



Depth from 0.05 to 7.51 m (dry)



Depth from 0.05 to 7.51 m (wet)

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-01
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555200.96 **N** : 5453400.12

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS						
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS				
					W _p	W _L		W			
			<table border="1"> <tr> <td>20</td> <td>40</td> <td>60</td> <td>80</td> </tr> </table>			20	40	60	80		
20	40	60	80								
0.10	87.47	Organics (moss and roots).	MA-1	X							
		Bottom of test pit, refusal on bedrock.									
1											
2											
3											
4											

COMMENTS:
 Bedrock is subhorizontal.



EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 5.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-01



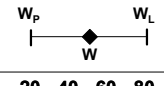
Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-02
DATE : 2015-10-07
COORDINATES : UTM 19 NAD83
E : 555169.94 **N** : 5453247.23

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
0.10	81.72	Sandy organic matter. Presence of roots.	MA-1	X			
		Bottom of test pit. Refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

Bedrock dipping approximately 6° in the North direction. See the following drawing for further details. The ground surface follows the bedrock dip.

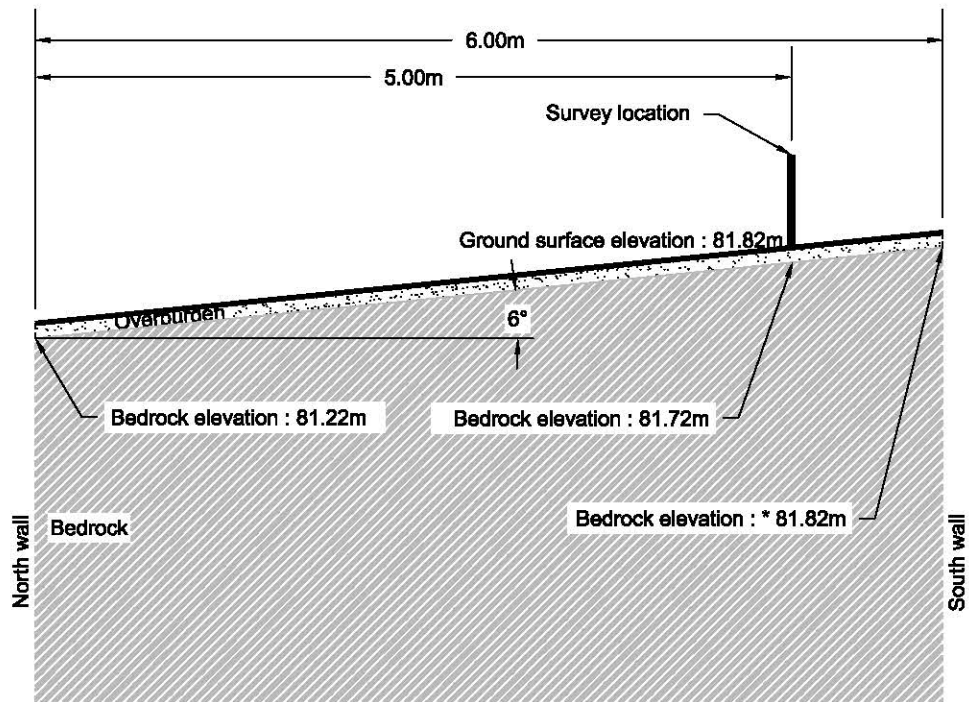

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m

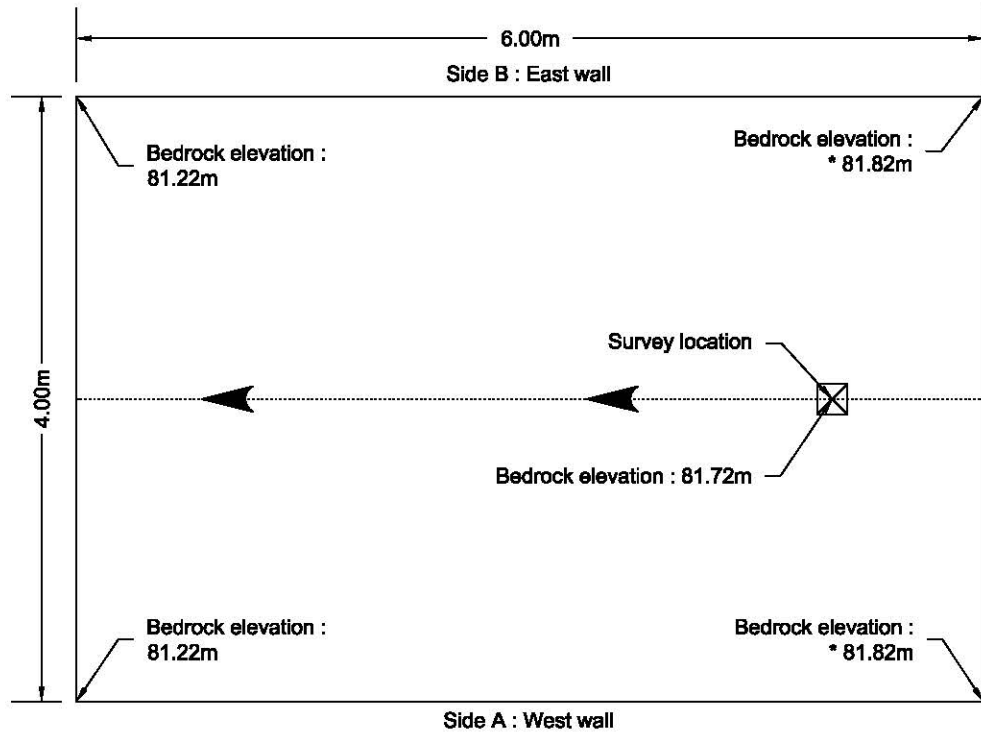


TP15-TMF-02

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-02



Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-03
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 555162.76 **N** : 5453204.17

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS				
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS			
							W_p W_L ----- W		
20	40	60	80						
0.05	81.14	Organics (moss and roots).	MA-1						
	81.09	Bottom of test pit, refusal on bedrock.							
1									
2									
3									
4									

COMMENTS:

Bedrock dipping approximately 4° in the South direction. The ground surface follows the bedrock dip.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 4.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-03



Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-04
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 555147.03 **N** : 5453142.03

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	80.28				WATER CONTENT AND ATTERBERG LIMITS (%) $ \begin{array}{c} W_p \quad \leftarrow \quad \blacklozenge \quad \rightarrow \quad W_L \\ \quad \quad \quad \\ \hline W \end{array} $	
0.10	80.18	Organics (moss).	MA-1	X	20 40 60 80 ----- ----- -----	
		Bottom of test pit, refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:

Bedrock dipping approximately 7° in the North direction. See the following drawing for further details. The ground surface follows the bedrock dip.

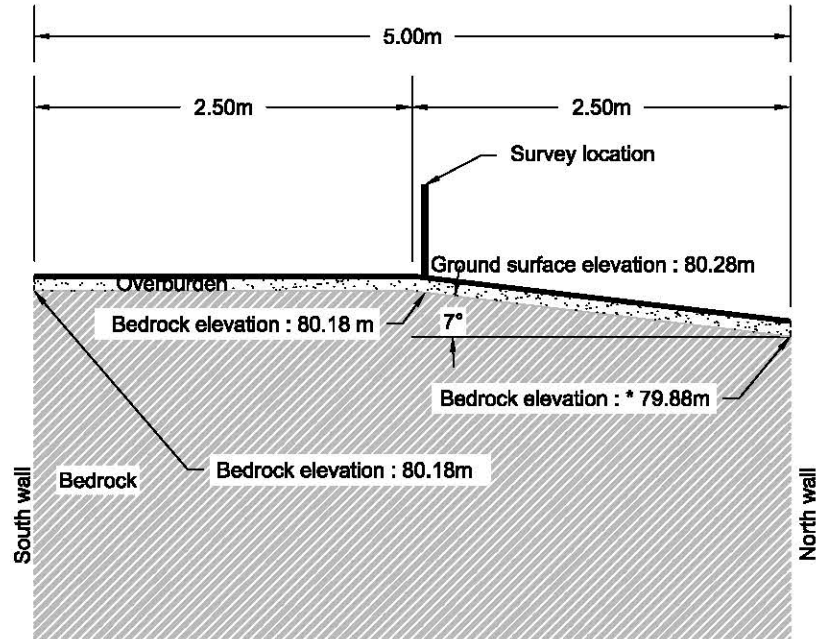

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.5m x 5.0m

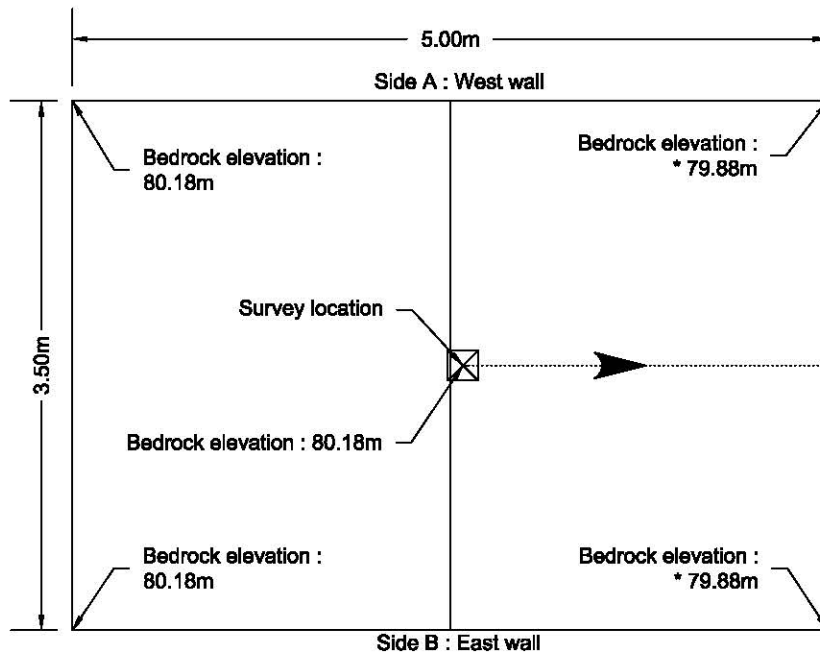


TP15-TMF-04

Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-04



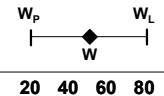
Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-05
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 555110.96 **N** : 5453072.25

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
0.10	81.14	Organics (moss).	MA-1	X			
		Bottom of test pit, refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

Bedrock dipping, 6° in the North-East direction. See the following drawing for further details. The ground surface follows the bedrock dip.

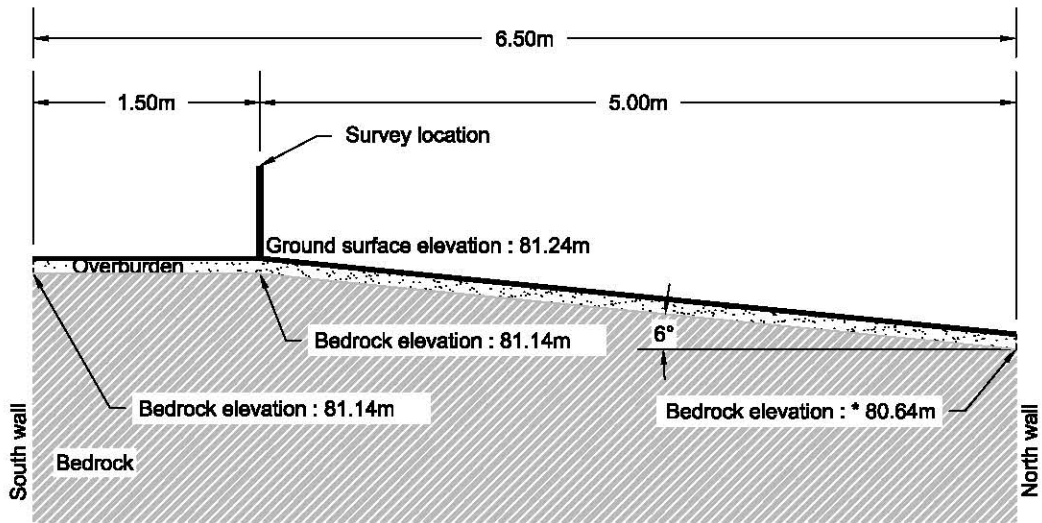

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.5m

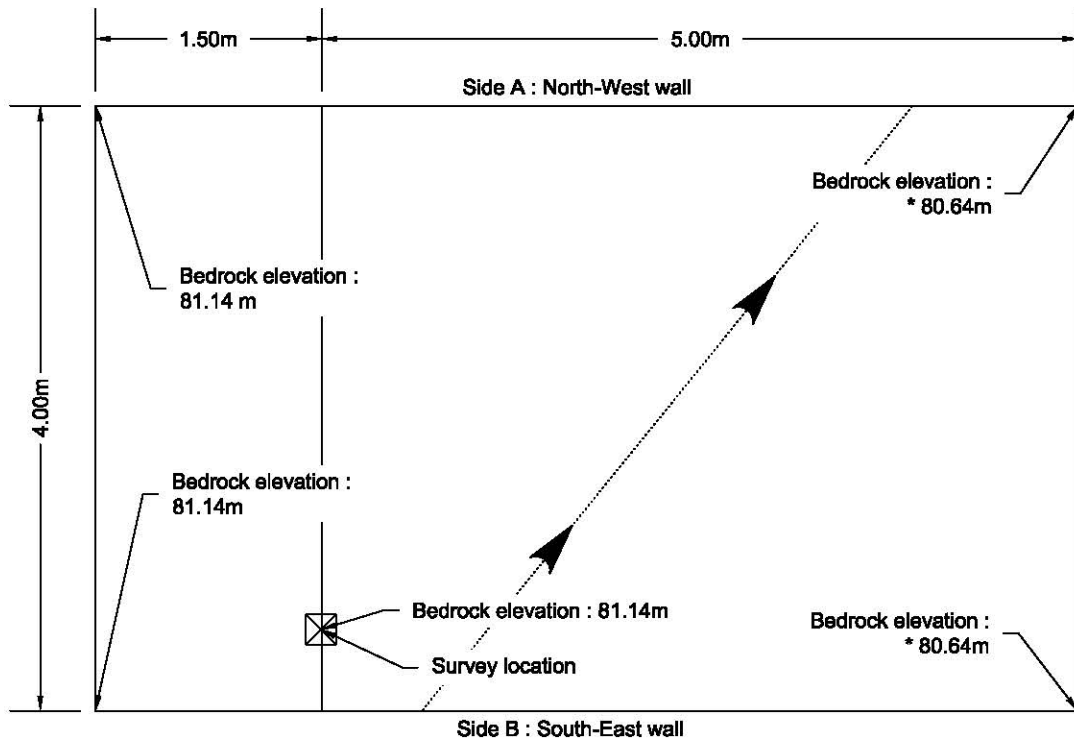


TP15-TMF-05

Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-05



Side A : North-West Wall



Side B : South-East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-06
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 555059.99 **N** : 5453089.74

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%) $\begin{array}{c} W_p \quad \quad W_L \\ \quad \quad \\ \text{---} \quad \quad \text{---} \\ \quad \quad \quad W \end{array}$	OTHER TESTS
					20 40 60 80	
	78.66	Organics (topsoil with roots). Presence of cobbles (5%) and boulders (2%).				
0.50	78.16	Grey silty clay, traces of sand.				
0.70	77.96	Bottom of test pit, refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:

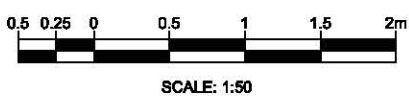
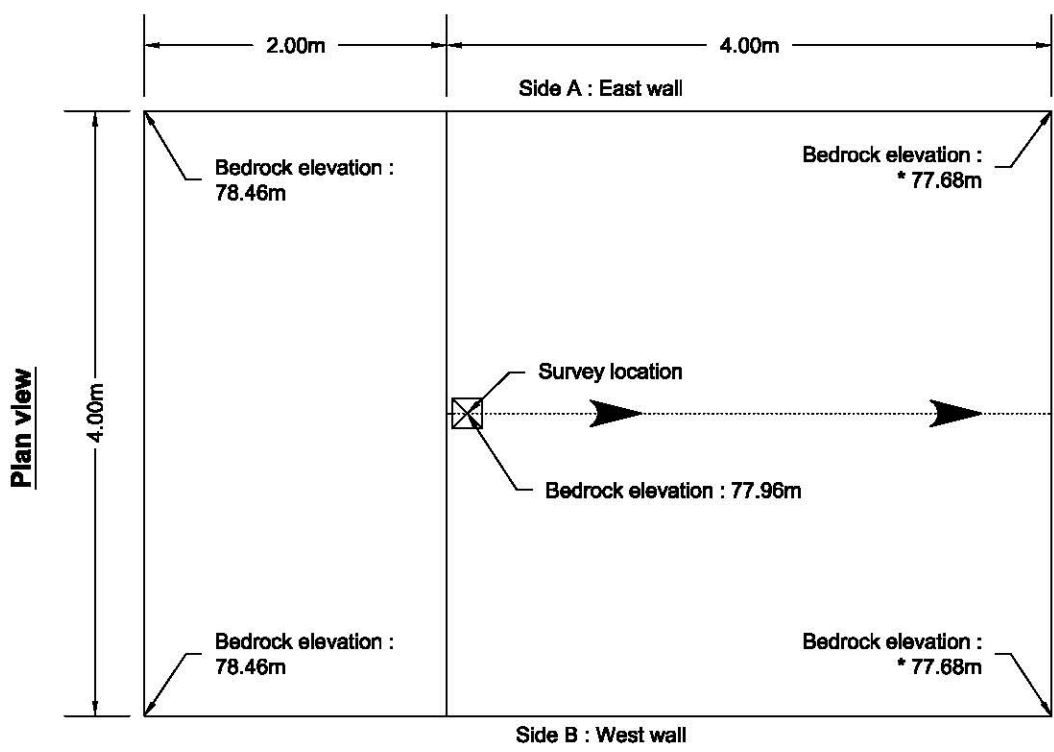
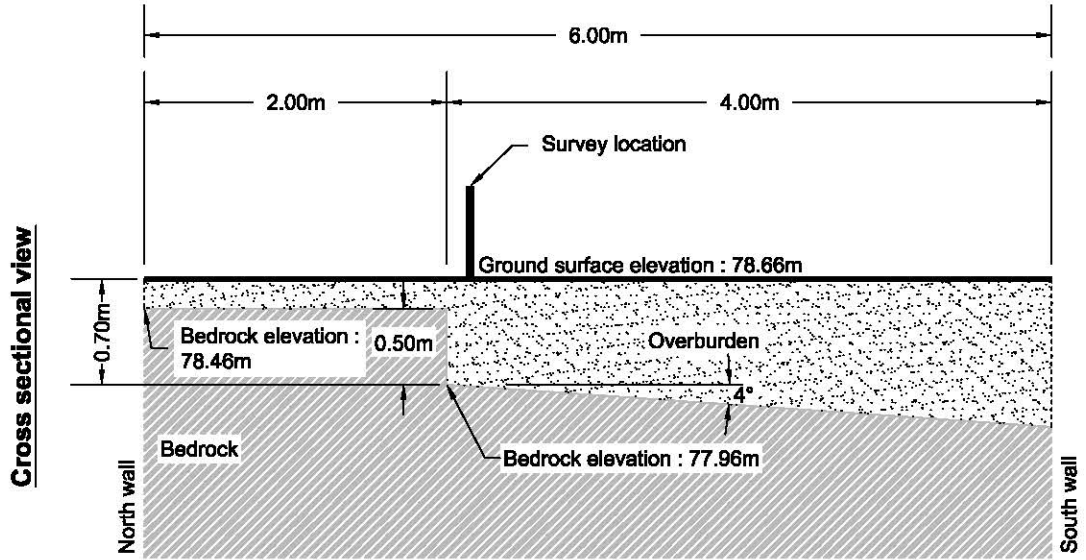
Cobbles and boulders probably detached from the underlying bedrock. Step-like bedrock dip in the South-East direction. See the following drawing for further details. Visible seepage at 0.3 m of depth in the South wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m



TP15-TMF-06



Legend : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-06



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-07
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 554998.19 **N** : 5453109.19

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	79.02				WATER CONTENT AND ATTERBERG LIMITS (%) $\begin{array}{c} W_p \quad \quad \quad W_L \\ \quad \quad \quad \\ \hline \quad \quad \quad W \end{array}$	
0.10	78.92	Organics (moss).	MA-1	X	20 40 60 80 ----- ----- -----	
		Bottom of test pit, refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:

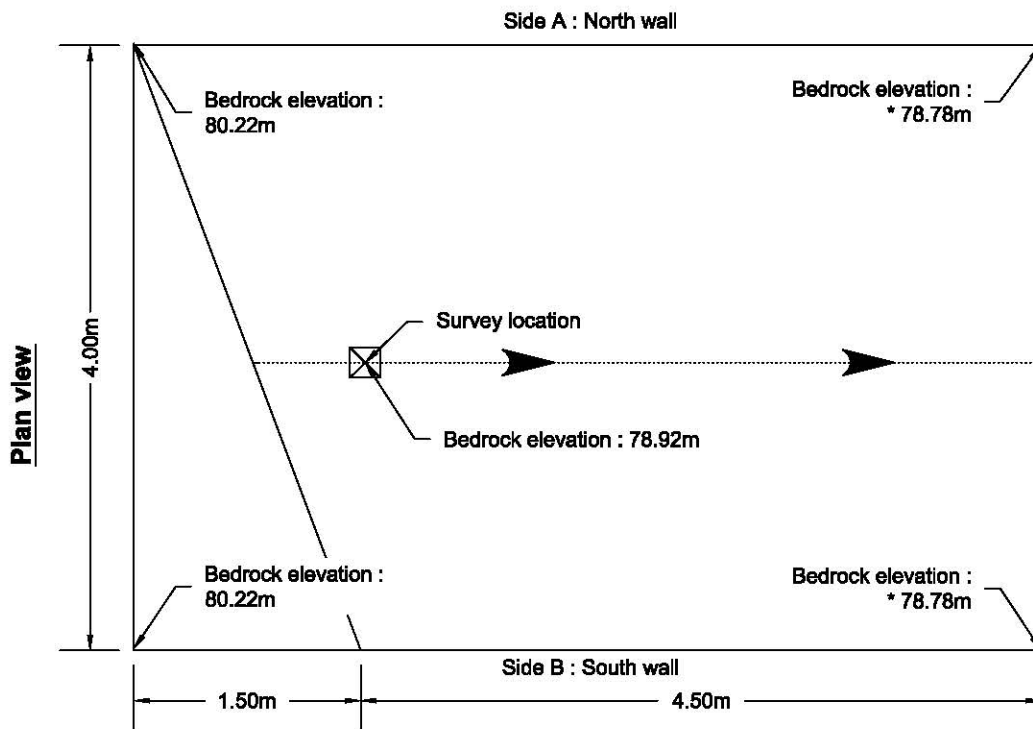
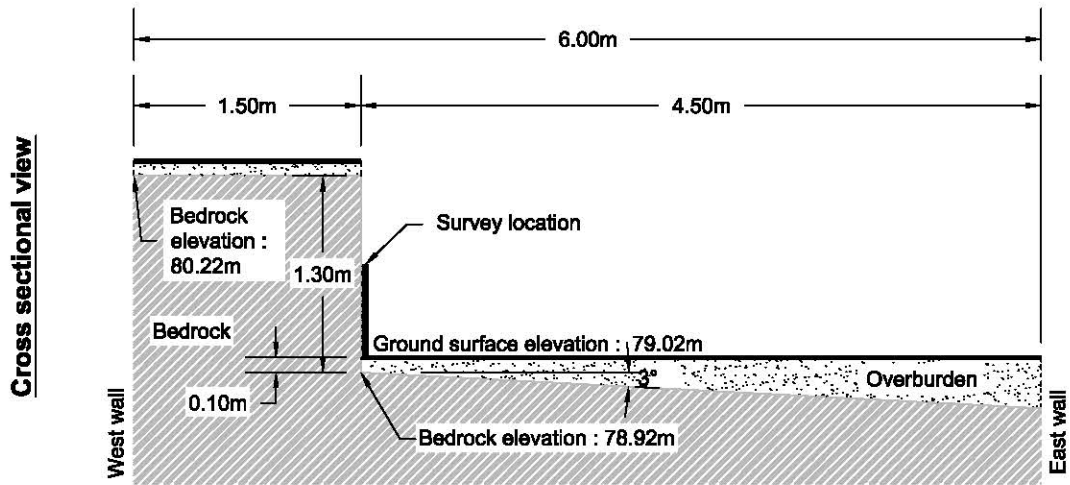
Step-like bedrock dip. See the following drawing for further details.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 6.0m



TP15-TMF-07



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-07



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-08
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 554887.31 **N** : 5453156.40

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS	
	82.98				WATER CONTENT AND ATTERBERG LIMITS (%) $ \begin{array}{c} W_p \quad \quad \quad W_L \\ \quad \quad \quad \\ \hline \quad \quad \quad W \\ \hline 20 \quad 40 \quad 60 \quad 80 \end{array} $		
0.20	82.78	Organics (moss and sandy organic matter). Presence of cobbles (1%).	MA-1	X			
		Bottom of test pit, refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

Bedrock dipping 8° in the South direction. See the following drawing for further details.

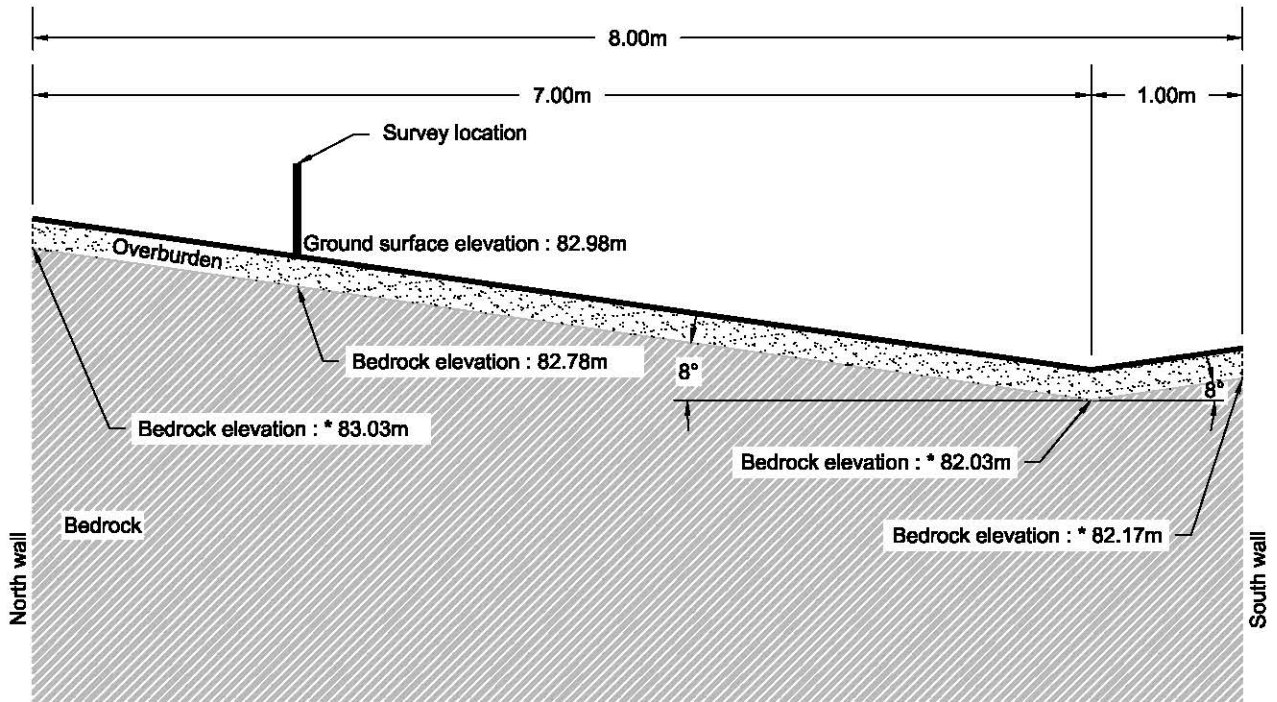

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 8.0m

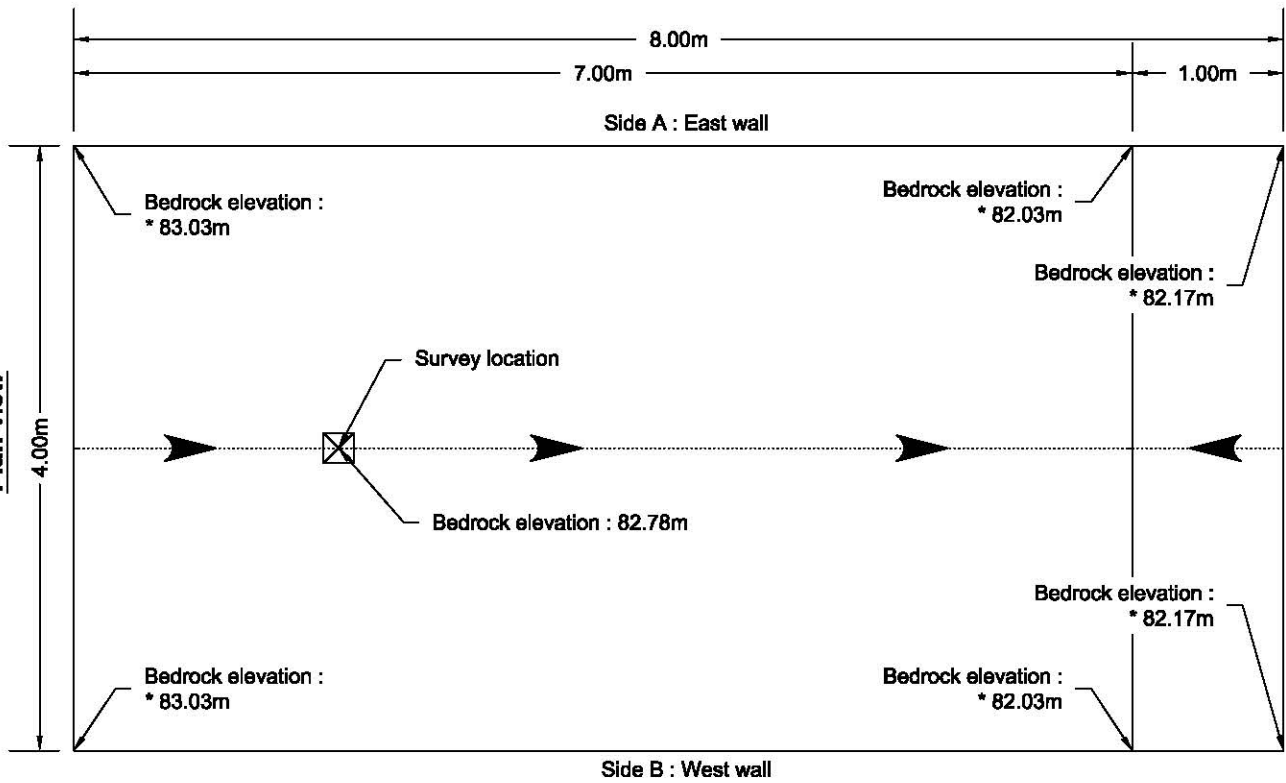


TP15-TMF-08

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-08



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-09
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 554920.25 **N** : 5453233.81

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
	79.79	Sandy organic matter. Presence of roots. Presence of cobbles (2%).	MA-1	X			
0.50	79.29	Bottom of test pit, refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

Bedrock is generally subhorizontal, but locally dipping 11° in the North direction. See the following drawing for further details.

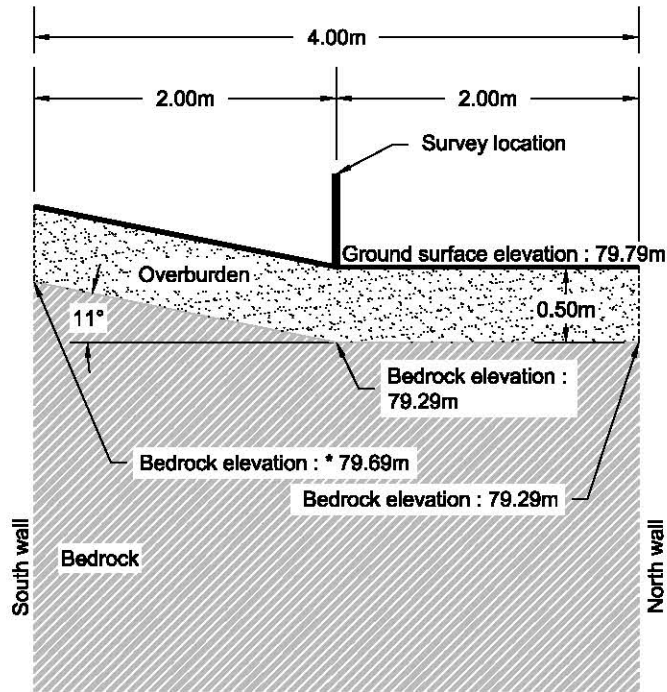

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 4.0m

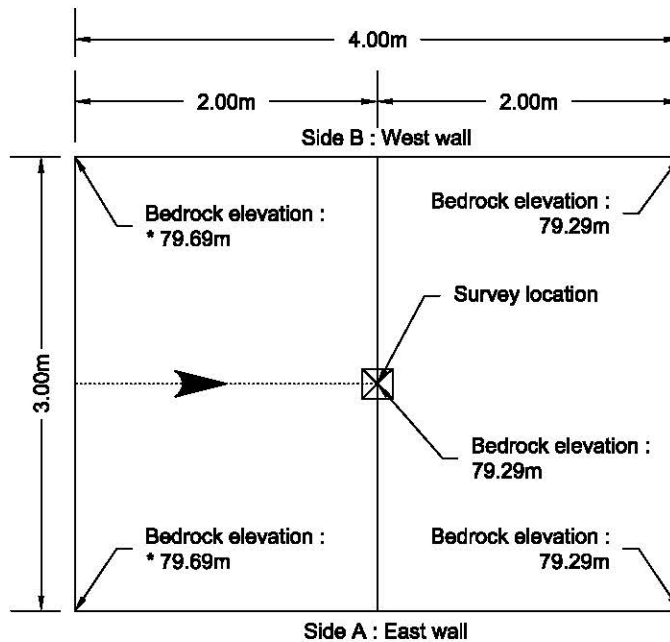


TP15-TMF-09

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-09



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-10
DATE : 2015-10-08
COORDINATES : UTM 19 NAD83
E : 554961.19 **N** : 5453340.50

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
0.40	79.80	Sandy organic matter. Presence of roots. Presence of cobbles (3%) and boulders (2%, max. diameter: 0.8 m).	MA-1	X			
1.00	79.40	Clayey and sandy silt. Presence of rock fragments. A large boulders (>0.5 m) is visible in the South-West corner of the trench.	MA-2	X	◆ 19		
1.30	78.50	Bottom of test pit, refusal on bedrock.	MA-3	X			

COMMENTS:

Bedrock dipping 6° in the South direction. See the following drawing for further details. Visible seepage at 1.3 m of depth on the North wall of the trench.

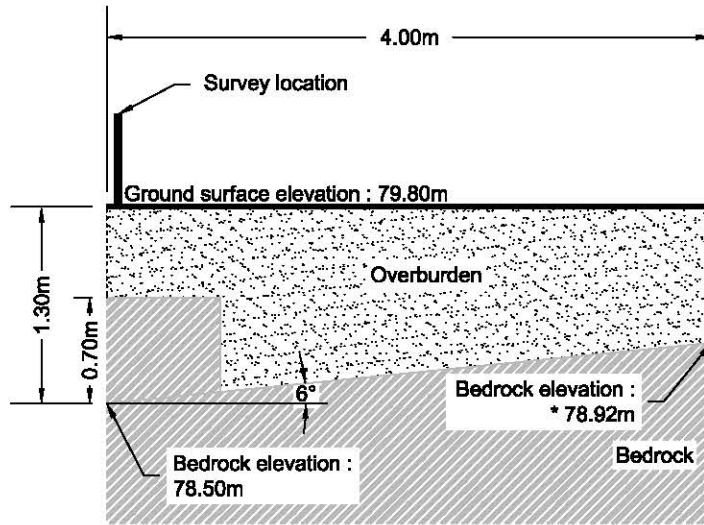

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.5m x 4.0m

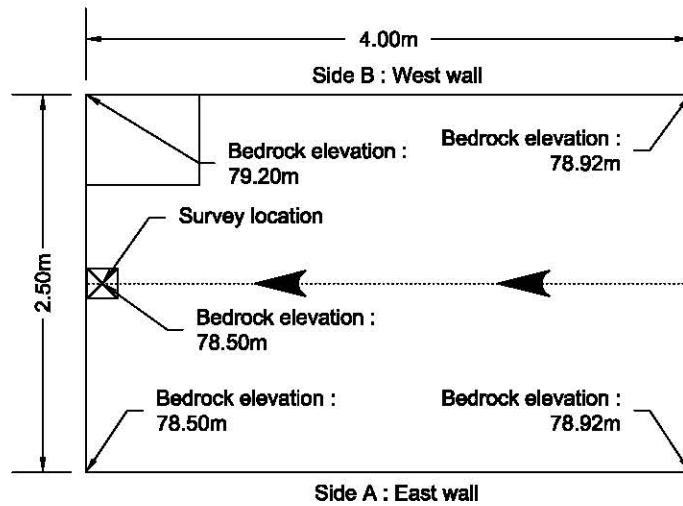


TP15-TMF-10

Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-10



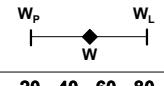
Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-11
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 554982.69 **N** : 5453392.53

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
	85.27	Moss and sandy organic matter.	MA-1	X			
0.20	85.07	Bottom of test pit, refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

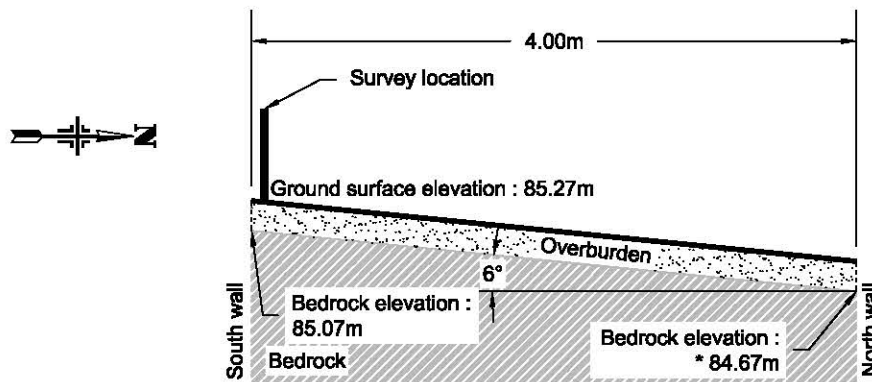
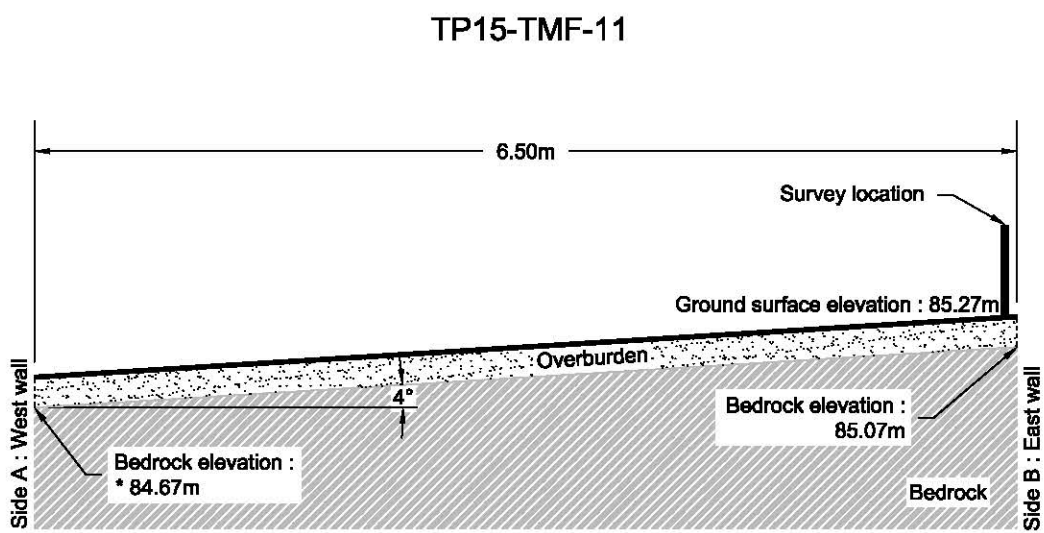
Bedrock dipping approximately 4° to 6° in the North-West direction. See the following drawing for further details.


EQUIPMENT : Komatsu PC138

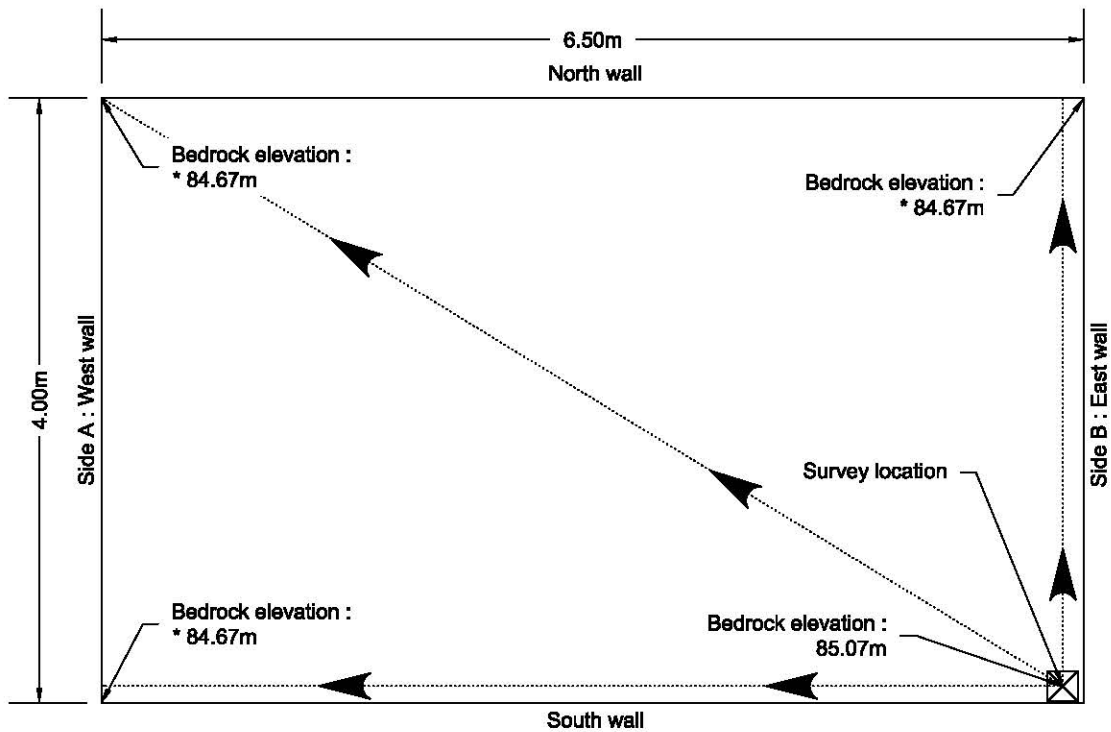
TEST PIT DIMENSIONS AT GROUND SURFACE : m x m

TP15-TMF-11

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-11



Side A : West Wall



Side B : East Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-12
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555005.44 **N** : 5453453.46

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
	87.44	Sandy organic matter. Presence of rock fragments.	MA-1	X			
0.40	87.04	Bottom of test pit, refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

The bedrock is dipping 3° in the North-East direction.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.5m x 4.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-12



Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-13
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555069.55 **N** : 5453456.44

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
			20	40	60	80	
	81.74	Organic matter: leaves, roots and topsoil.	MA-1	X			
0.30	81.44	Grey silty clay, traces of sand. Oxydated clay from 0.3 to 1.0 m.	MA-2	X	21		
			MA-3	X			
1.30	80.44	End of test pit					

COMMENTS:

Bedrock dipping 8° in the North-West direction. See the following drawing for further details.
 Visible seepage at 1.1 m of depth, coming from the South wall of the trench.

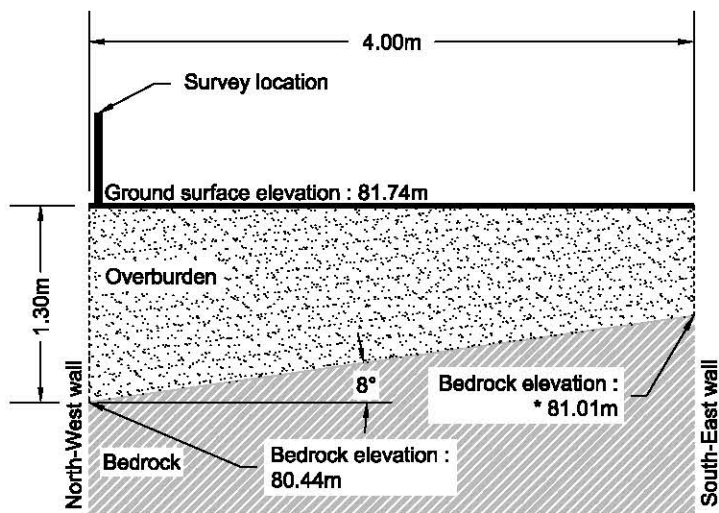

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.5m x 4.0m

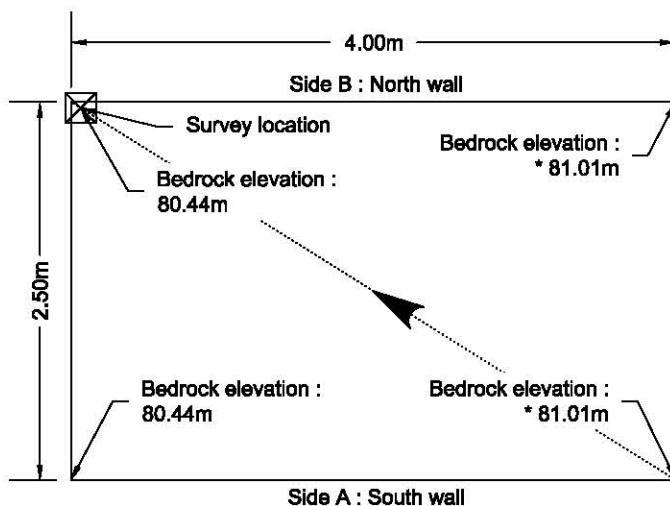
TP15-TMF-13



Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-13



Side A : South Wall



Side B : North Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-14
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555129.83 **N** : 5453453.27

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS	
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	83.18					
		Topsoil with presence of roots.. Presence of cobbles (2%) and boulders (2%, max. diameter: 0.6 m) associated with rock fragments.	MA-1	X		
0.50	82.68					
0.60	82.58	Sand, some gravel. Present in the horizontal section of the test pit only.	MA-2	X		
		Bottom of test pit, refusal on bedrock.				
1						
2						
3						
4						

COMMENTS:

Step-like dip in the South direction. See the following drawing for further details. Visible seepage at the bottom of the test pit.

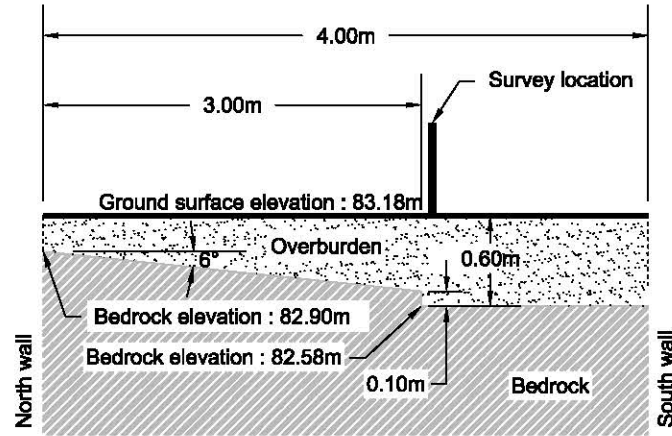

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.5m x 5.0m

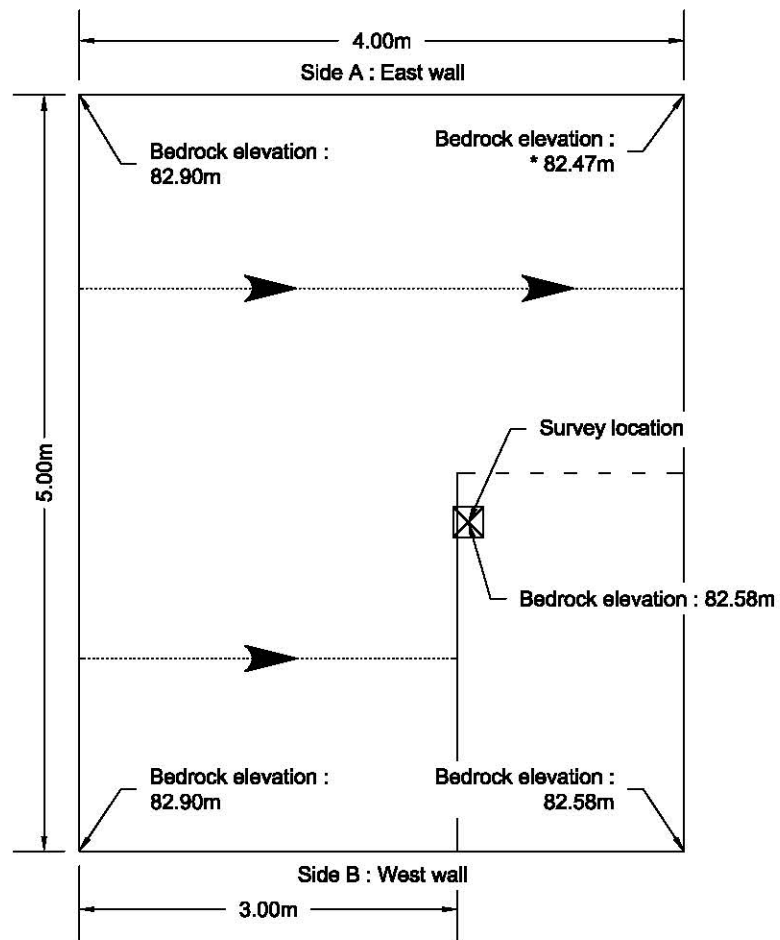


TP15-TMF-14

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-14



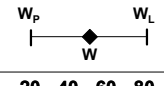
Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-15
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555182.48 **N** : 5453454.88

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
	86.69	Organics (moss).	MA-1	X			
0.20	86.49	Bottom of test pit, refusal on bedrock.					
1							
2							
3							
4							

COMMENTS:

Bedrock dipping locally 17° in the North direction. See the following drawing for further details.
 The bedrock in the area is generally sub-horizontal.

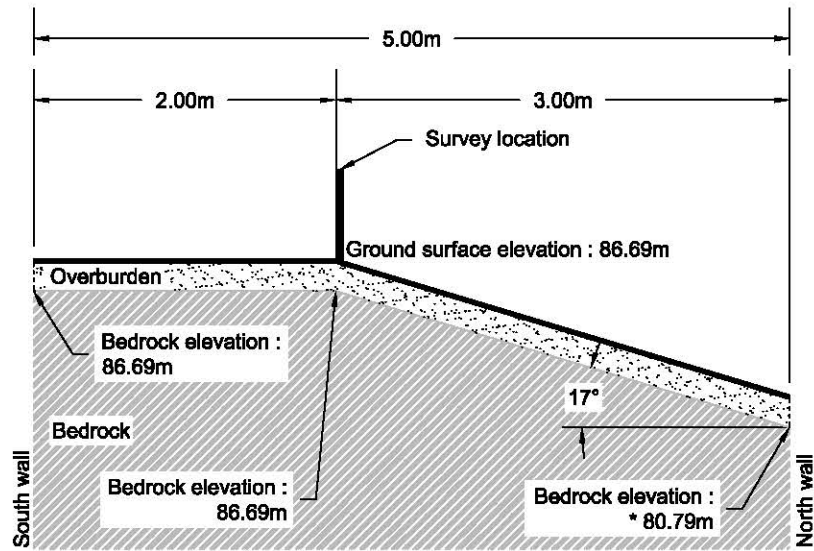

EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 6.0m x 5.0m

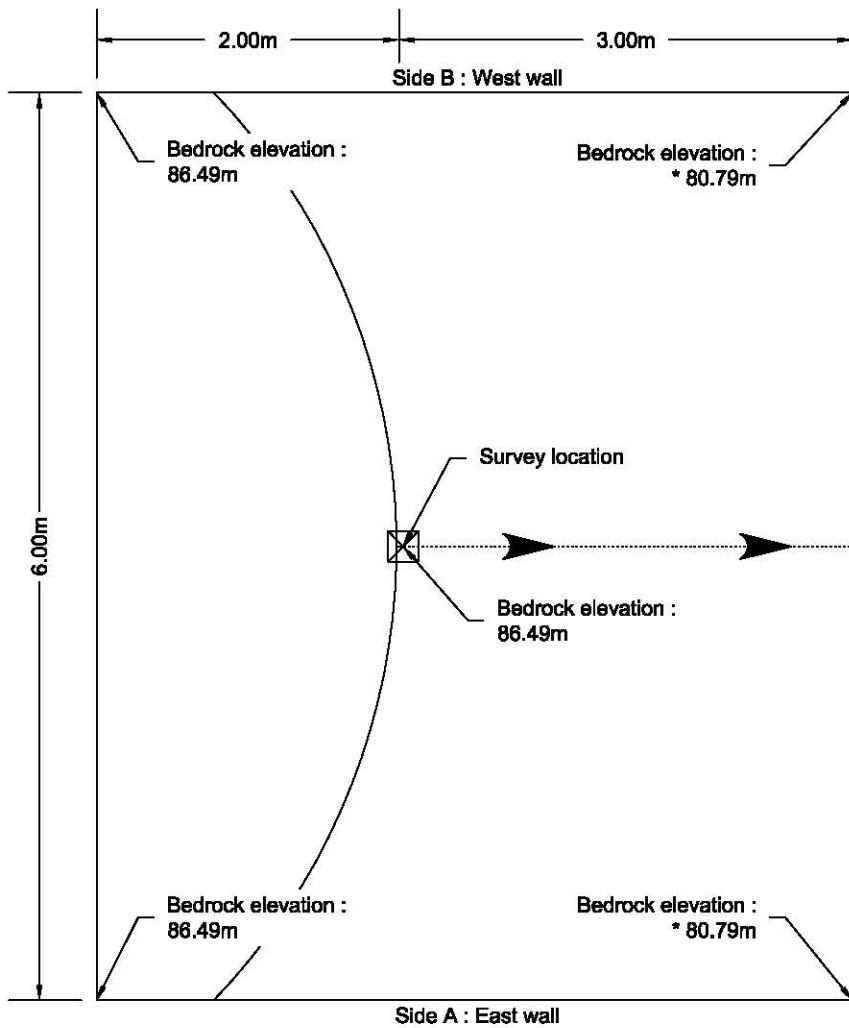


TP15-TMF-15

Cross sectional view



Plan view



Legend

-----> : dip direction



SCALE: 1:50

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-15



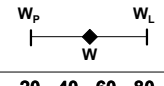
Side A : East Wall



Side B : West Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-16
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555265.18 **N** : 5453398.39

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
	84.05	Sandy organic matter. Presence of roots.	MA-1	X			
0.30	83.75	End of test pit					
1							
2							
3							
4							

COMMENTS:

Bedrock dipping 6° in the East direction. See the following drawing for further details.

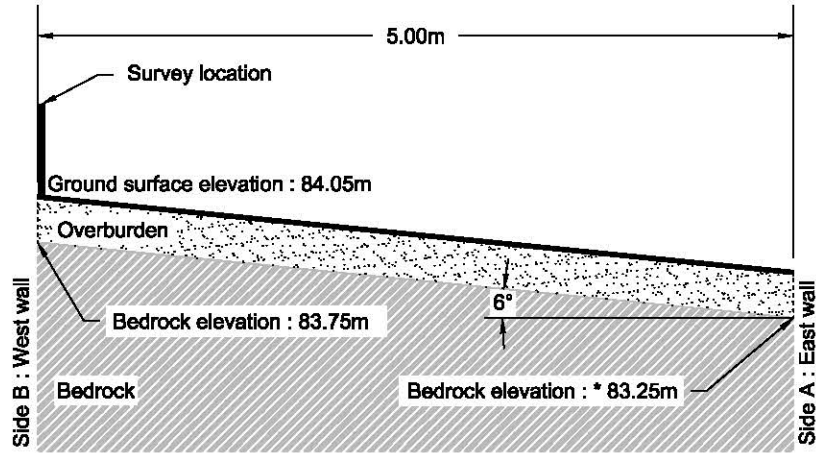
EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 4.0m x 5.0m

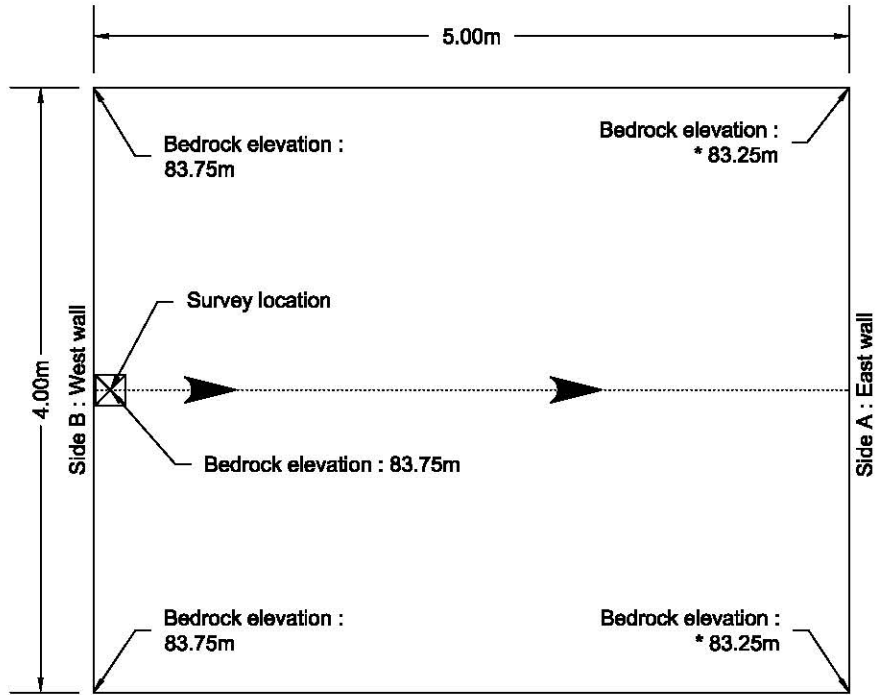



TP15-TMF-16

Cross sectional view



Plan view



SCALE: 1:50

Legend

-----> : dip direction

Note: * The bedrock elevation was extrapolated using the overall bedrock dip measured on the field.

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-16



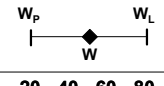
Side A : East Wall



Side B : North Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-17
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555266.76 **N** : 5453249.23

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS		
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS
					W _p	W _L	
							
	79.41	Topsoil. Presence of wood debris and roots. Presence of wood debris.	MA-1				
			MA-2				
			MA-3				
			MA-4				
			MA-5				
2.50	76.91	Clayey silt of medium plasticity (CL). Presence of one boulders (max. diameter: 0.5 m).	MA-6		19	33	S
			MA-7		25		
3.50	75.91	Bottom of test pit, refusal on bedrock.					

COMMENTS:

The bedrock dip is probably sub-horizontal but was not observed because of the water ponding at the bottom of the trench. Visible seepage at 0.5 m from each wall of the trench.


EQUIPMENT : Komatsu PC138

TEST PIT DIMENSIONS AT GROUND SURFACE : 2.0m x 4.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-17



Side A : North Wall



Side B : South Wall

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
FILE : 632622

TEST PIT : TP15-TMF-18
DATE : 2015-10-15
COORDINATES : UTM 19 NAD83
E : 555315.54 **N** : 5453134.67

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES		IN SITU AND LABORATORY TESTS						
			TYPE AND NUMBER	CONDITION	WATER CONTENT AND ATTERBERG LIMITS (%)		OTHER TESTS				
					W _p	W _L		W			
			<table border="1"> <tr> <td>20</td> <td>40</td> <td>60</td> <td>80</td> </tr> </table>			20	40	60	80		
20	40	60	80								
	78.72	Organic matter. Presence of wood debris and roots.	MA-1	X							
0.80	77.92	Sand, some gravel, some silt, traces of clay. Presence of rock fragments.	MA-2	X							
1.20	77.52	Bottom of test pit, refusal on bedrock.	MA-3	X	25		S				

COMMENTS:
 Bedrock dipping 3° in the South-East direction. Visible seepage at 0.7 m of depth, coming from the South wall of the trench.



EQUIPMENT : Komatsu PC138

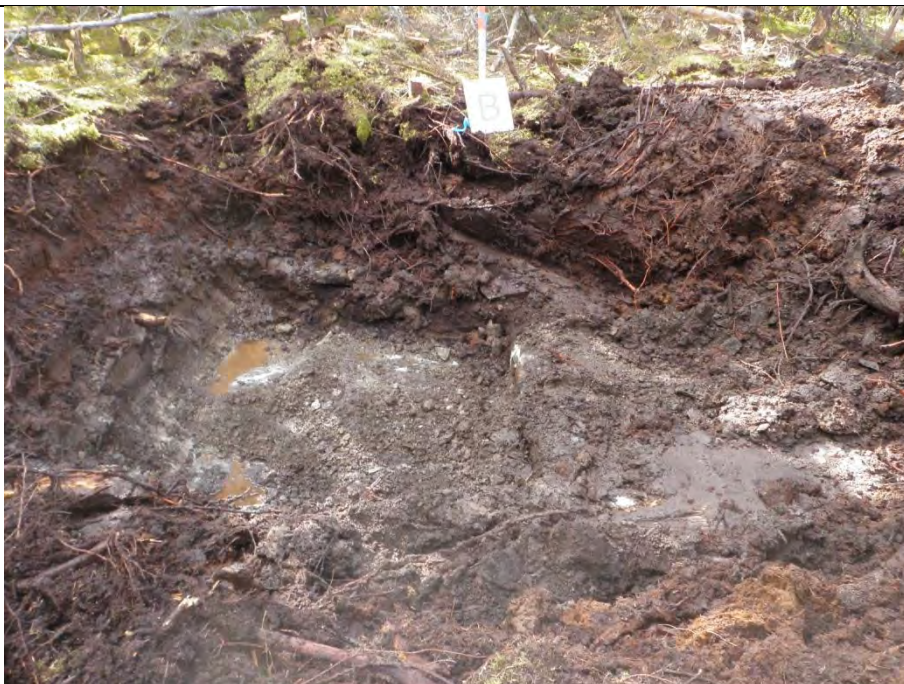
TEST PIT DIMENSIONS AT GROUND SURFACE : 3.0m x 5.0m

CLIENT : Mason Graphite inc. / Hatch Ltée.
PROJET : Preliminary Geotechnical Investigation
ENDROIT : Concentrator Site, Baie-Comeau, Quebec
NO DOSSIER QUALITAS : 632622.2

TP15-TMF-18



Side A : North-East Wall



Side B : South-West Wall

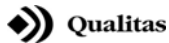
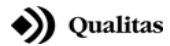


Table 1.1
Description of individual joints

Borehole no.	Depth (m)	Structure type	Core Angle (°)	Aperture/ Thickness (mm)	Shape	Roughness	Infilling/ Coating	Infilling hardness	Weathering
BH-15-TMF-01	0.28	Closed joint	5	0	Undulating	Very rough	None	None	None
	0.57	Closed joint	10	0	Planar	Very rough	None	None	None
	0.63	Open Joint	70	80	Planar	Rough	Limonite	Hard	None
	0.79	Closed joint	50	0	Planar	Very rough	None	None	None
	0.82	Closed joint	5	0	Undulating	Very rough	None	None	None
	0.87	Closed joint	75	0	Planar	Rough	None	None	None
	1.10	Closed joint	80	0	Planar	Very rough	None	None	None
	1.12	Closed joint	45	0	Planar	Very rough	None	None	None
	1.29	Closed joint	40	0	Planar	Very rough	None	None	None
	1.53	Closed joint	50	0	Planar	Slightly rough	None	None	None
	2.12	Closed joint	70	0	Planar	Rough	None	None	None
	2.15	Closed joint	5	0	Planar	Rough	Calcite	Soft	None
	2.25	Closed joint	10	0	Planar	Rough	Calcite, Chlorite, Pyrite	Soft	None
	2.39	Closed joint	35	0	Irregular	Very rough	None	None	None
	2.42	Closed joint	35	0	Planar	Very rough	None	None	Very slightly
	2.65	Mechanic break	80	0	Irregular	Very rough	None	None	None
	4.40	Closed joint	2	0	Planar	Rough	Calcite	Soft	None
	4.48	Closed joint	65	0	Planar	Rough	None	None	None
	5.02	Closed joint	50	0	Planar	Very rough	None	None	None
	5.10	Closed joint	60	0	Planar	rough	Calcite	Soft	None
	5.30	Mechanic break	75	0	Irregular	Very rough	None	None	None
	5.87	Closed joint	55	0	Planar	Very rough	None	None	None
	5.90	Mechanic break	70	0	Planar	Very rough	None	None	None
6.00	Mechanic break	80	0	Irregular	Very rough	None	None	None	
6.51	Closed joint	60	0	Irregular	Very rough	None	None	None	
6.60	Closed joint	0	0	Undulating	Rough	Calcite	Soft	None	
7.13	Closed joint	60	0	Planar	Very rough	None	None	Very slightly	
7.47	Mechanic break	80	0	Planar	Slightly rough	None	None	None	
BH-15-TMF-02	2.44	Mechanic break	80	0	Planar	Polished by	None	None	None
	2.45	Foliation Closed joint	70	0	Planar	Rough	None	None	None
	2.55	Fractured zone	5	250	Planar	Slightly rough	Chlorite, Calcite	Soft	None
	2.76	Mechanic break	70	0	Irregular	Rough	None	None	None
	3.01	Foliation Closed joint	75	0	Planar	Very rough	None	None	None
	4.03	Closed joint	20	0	Planar	Rough	Calcite	Soft	None
	4.35	Closed joint	65	0	Irregular	Slightly rough	Chlorite	Soft	None
	4.39	Closed joint	60	0	Planar	rough	None	None	None
	5.00	Closed joint	80	0	Planar	Very rough	None	None	None
	5.55	Closed joint	40	0	Irregular	Slightly rough	Chlorite	None	None
	5.61	Closed joint	70	0	Planar	Slightly rough	None	None	None
	5.63	Closed joint	2	0	Planar	Slightly rough	Chlorite	Soft	None
	6.00	Closed joint	70	0	Planar	Rough	None	None	None
	6.03	Closed joint	10	0	Planar	Rough	None	None	Slightly
	6.05	Closed joint	50	0	Planar	Rough	None	None	Moderately
	6.08	Closed joint	0	0	Planar	Rough	None	None	Moderately
	6.12	Fractured zone	60	70	Planar	Rough	None	None	Moderately
	6.27	Closed joint	65	0	Planar	Rough	None	None	None
	6.30	Closed joint	40	0	Planar	Rough	None	None	None
	6.41	Closed joint	30	0	Planar	Rough	Chlorite	Soft	Slightly
	6.48	Closed joint	10	0	Planar	Rough	Calcite	Soft	None
	6.54	Closed joint	25	0	Planar	Smooth	Chlorite	Soft	None
	6.58	Closed joint	50	0	Planar	Smooth	Chlorite	Soft	None
	6.79	Closed joint	75	0	Irregular	Rough	None	None	None
	6.91	Closed joint	65	0	Irregular	Rough	None	None	None
	7.26	Closed joint	45	0	Irregular	Rough	Chlorite	Hard	None
	7.36	Closed joint	45	0	Planar	Rough	Chlorite, Calcite	Soft	Moderately
	7.39	Closed joint	2	0	Planar	Rough	Chlorite	Soft	Moderately
	7.42	Closed joint	70	0	Planar	Rough	Chlorite, Calcite	Soft	Moderately
	7.46	Closed joint	10	0	Irregular	Rough	Chlorite, Calcite	Soft	None
7.70	Partially Open joint	30	2	Planar	Slightly rough	Calcite	Soft	Slightly	
8.26	Closed joint	70	0	Planar	Rough	None	None	None	
8.29	Closed joint	60	0	Planar	Slightly rough	Chlorite	Soft	Slightly	
8.94	Closed joint	25	0	Planar	Rough	None	None	None	
9.01	Closed joint	50	0	Irregular	Very rough	None	None	None	
9.06	Closed joint	50	0	Planar	Rough	None	None	None	
9.11	Closed joint	15	0	Planar	Rough	None	None	None	
BH-15-TMF-03	0.49	Closed joint	70	0	Planar	Rough	None	None	None
	0.76	Closed joint	70	0	Planar	Rough	None	None	None
	0.84	Closed joint	75	0	Irregular	Very rough	None	None	None
	1.04	Open Joint	85	130	Irregular	Slightly rough	Unknown	Unknown	None
	1.29	Closed joint	55	0	Irregular	Smooth	Chlorite, Limonite	Soft	Slightly
	1.41	Open Joint	80	10	Irregular	Rough	Limonite	Hard	Slightly
	1.89	Foliation Closed joint	65	0	Planar	Rough	None	None	None
	2.23	Closed joint	45	0	Planar	Very rough	None	None	None
2.40	Closed joint	70	0	Planar	Rough	None	None	None	



CLIENT: Mason Graphite inc./Hatch Ltée.
 PROJECT: Preliminary Geotechnical Investigation
 LOCATION: Concentrator site, Baie-Comeau, Quebec
 QUALITAS FILE NO.: 632622.2

Table 1.2 Rock Mass Rating details (RMR)														
Borehole No.	Geomechanical Zone	From	To	A1	A2	A3	A4a	A4b	A4c	A4d	A4e	A4	Dry RMR	Rock quality
				Compression Strength	RQD	Spacing	Persistence	Aperture	Roughness	Filling	Weathering	Condition of discontinuities (a+b+c+d+e)	(A1+A2+A3+A4+15)	
				(0-15)	(0-20)	(0-20)	(1-6)	(1-6)	(1-6)	(1-6)	(1-6)	(0-30)	(0-100)	
BH-15-TMF-01	The rock is generally of good quality. Joint Conditions Parameters are restricted by the possible joint at 0.63 m.	0.08	7.67	7	18	9	2	0	1	3	5	11	60	Fair
BH-15-TMF-02	The rock is generally of good quality. RMR is restricted by possible open joints at 2.44 m and 6.12 m.	2.29	9.26	10	15	8	2	0	1	0	3	6	54	Fair
BH-15-TMF-03	The rock is generally of good quality. RMR is restricted by the possible open joint at 1.41 m.	0.3	7.6	10	15	10	2	0	3	0	5	10	60	Fair
BH-15-TMF-04	The rock is generally of good quality. RMR is restricted by the possible open joint at 0.89 m and the partially open joint at 2.35 m.	0.05	7.51	10	18	10	2	0	3	0	3	8	61	Fair/Good



Table 1
Description of individual joints

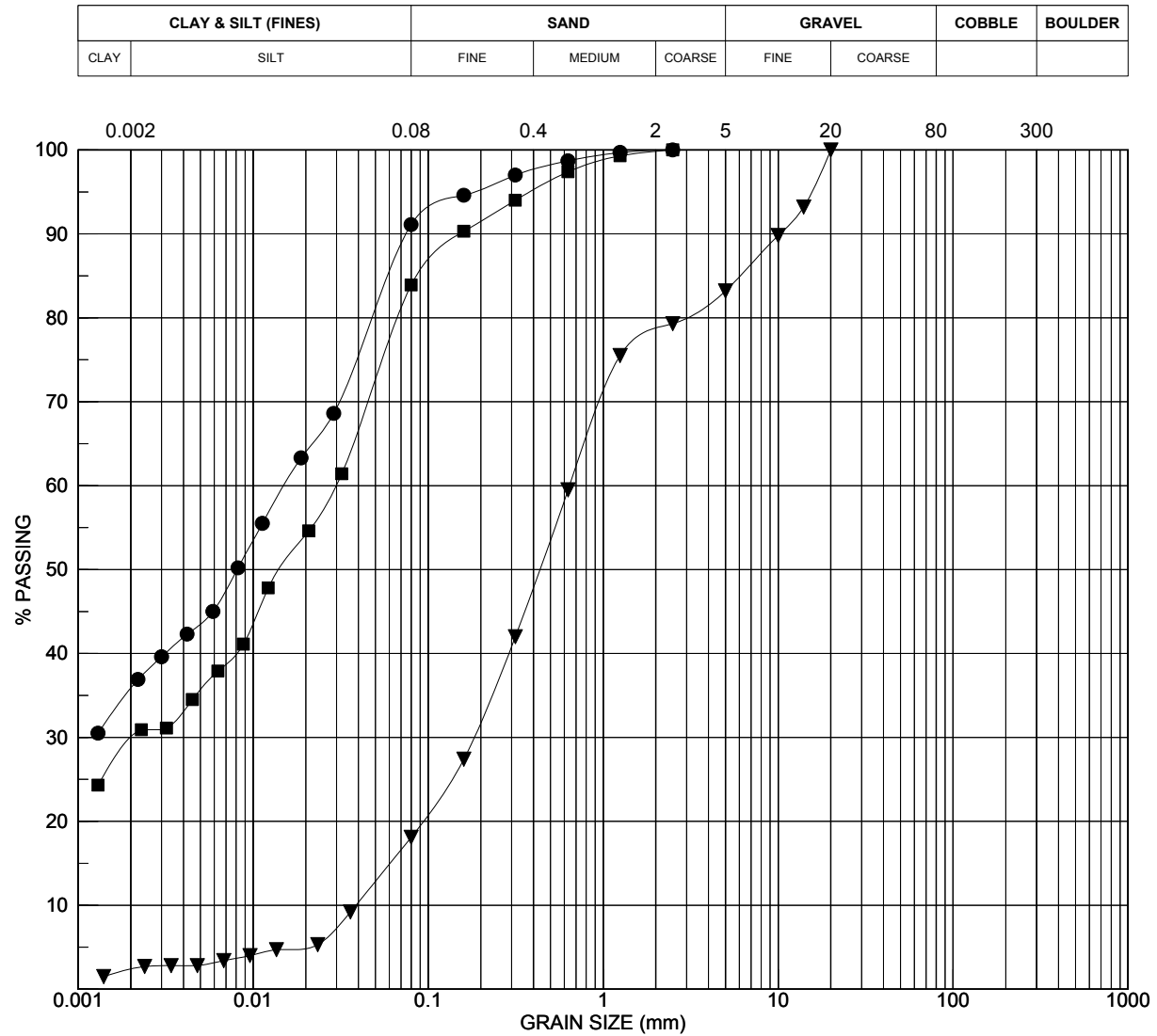
Borehole no.	Depth (m)	Structure type	Core Angle (°)	Aperture/ Thickness (mm)	Shape	Roughness	Infilling/ Coating	Infilling hardness	Weathering
BH-15-TMF-03	2.71	Foliation Closed joint	75	0	Planar	Rough	None	None	None
	2.90	Closed joint	85	0	Planar	Rough	None	None	None
	3.15	Closed joint	85	0	Planar	Rough	None	None	None
	3.31	Closed joint	65	0	Irregular	Rough	None	None	None
	3.53	Closed joint	75	0	Planar	Rough	None	None	None
	3.57	Closed joint	70	0	Planar	Rough	None	None	None
	3.65	Closed joint	80	0	Planar	Rough	None	None	None
	4.24	Closed joint	75	0	Irregular	Rough	None	None	None
	4.52	Closed joint	70	0	Undulating	Slightly rough	Chlorite	Hard	None
	4.75	Closed joint	80	0	Planar	Rough	None	None	None
	4.94	Foliation Closed joint	90	0	Irregular	Rough	None	None	None
	5.03	Foliation Closed joint	85	0	Irregular	Rough	None	None	None
	5.27	Foliation Closed joint	80	0	Planar	Rough	None	None	None
	5.77	Closed joint	80	0	Planar	Rough	None	None	None
	6.03	Closed joint	80	0	Irregular	Very rough	None	None	None
7.02	Closed joint	85	0	Planar	Rough	None	None	None	
7.15	Closed joint	85	0	Planar	Rough	None	None	None	
BH-15-TMF-04	0.68	Closed joint	80	0	Planar	Very rough	Limonite	Hard	None
	0.89	Open Joint	80	90	Planar	Very rough	Unknown	Unknown	None
	1.00	Closed joint	70	0	Planar	Slightly rough	White Soft Mineral, Limonite	Soft	None
	1.20	Closed joint	65	0	Planar	Rough	None	None	None
	2.08	Closed joint	75	0	Planar	Rough	None	None	None
	2.11	Open Joint	65	30	Irregular	Rough	Unknown	Unknown	None
	2.17	Open Joint	80	15	Irregular	Rough	Limonite	Hard	Slightly
	2.35	Partially Open Joint	45	5	Planar	Rough	Weathered and Decomposed Rock	Soft	Moderately
	2.39	Closed joint	85	0	Planar	Rough	Limonite	Hard	None
	2.80	Closed joint	65	0	Planar	Rough	None	None	None
	3.05	Closed joint	50	0	Planar	Rough	Calcite	Soft	None
	3.33	Closed joint	2	0	Undulating	Rough	Calcite	Soft	Very slightly
	3.96	Closed joint	75	0	Planar	Rough	Limonite	Hard	None
	3.98	Closed joint	75	0	Planar	Rough	None	None	None
	4.01	Closed joint	15	0	Planar	Slightly rough	Gauge	Limonite	Moderately
	4.05	Closed joint	80	0	Planar	Rough	None	None	None
	4.35	Closed joint	2	0	Planar	Rough	None	None	None
	4.44	Mechanic break	85	0	Irregular	Very rough	None	None	None
	5.54	Closed joint	65	0	Irregular	Rough	None	None	None
	6.17	Closed joint	65	0	Planar	Very rough	None	None	None
	6.25	Closed joint	0	0	Planar	Rough	None	None	None
	6.34	Closed joint	80	0	Irregular	Rough	None	None	None
	6.41	Closed joint	50	0	Irregular	Very rough	None	None	None
	6.65	Closed joint	80	0	Planar	Slightly rough	None	None	None
	6.69	Closed joint	0	0	Planar	Rough	None	None	None
	6.72	Closed joint	80	0	Planar	Rough	None	None	None
	6.74	Closed joint	80	0	Planar	Rough	None	None	None
6.77	Closed joint	80	0	Planar	Rough	Clay, Limonite	Soft	None	
6.79	Closed joint	85	0	Planar	Rough	None	None	None	
6.81	Closed joint	85	0	Planar	Rough	None	None	None	
7.11	Closed joint	15	0	Planar	Rough	Calcite	None	None	
7.27	Closed joint	65	0	Irregular	Rough	None	None	None	
7.37	Closed joint	65	0	Planar	Rough	None	None	None	

APPENDIX 2

LABORATORY TEST RESULTS ON SOIL

CLIENT : Mason Graphite inc. / Hatch Ltee.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

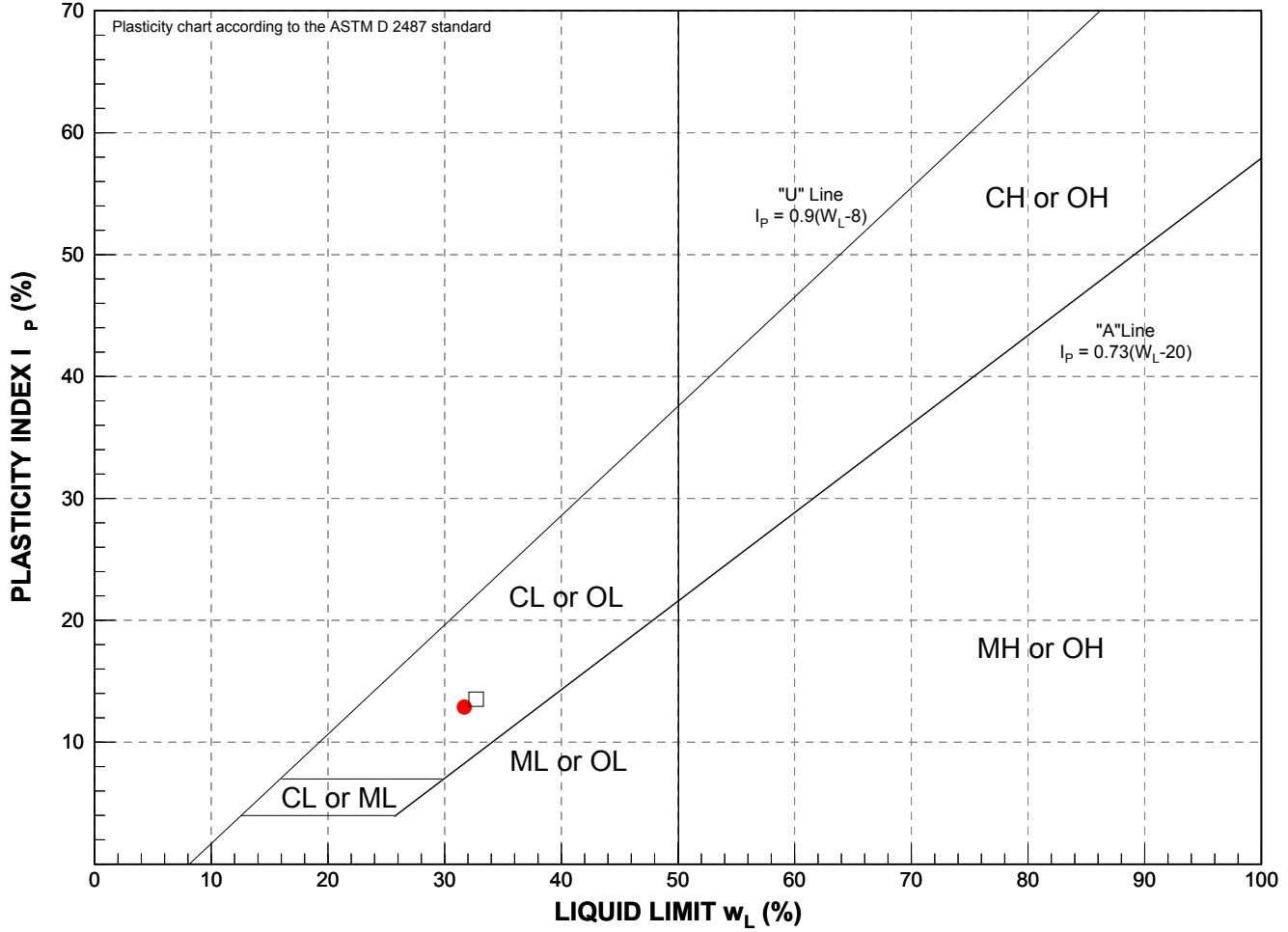
FIGURE 2.1



	Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	BH15-TMF-02	CF-3	1,22 - 1,83	Silt and clay, traces of sand.	0	9	55	36
■	TP15-TMF-17	MA-6	2,50 - 3,00	Clayey silt, some sand.	0	16	54	30
▼	TP15-TMF-18	MA-3	0,80 - 1,20	Sand, some gravel and silt, traces of clay.	17	65	16	2

CLIENT : Mason Graphite inc. / Hatch Ltee.
 PROJECT : Preliminary Geotechnical Investigation
 LOCATION : Concentrator Site, Baie-Comeau, Quebec
 FILE : 632622

Figure 2.2



Symbol	Borehole	Type	Sample	Depth		w	w _L	w _p	I _L	I _p	USCS	Description
				from	to							
●	BH15-TMF-02	CF	3	1.22	1.83	31	32	19	0.9	13	CL	-
□	TP15-TMF-17	MA	6	2.50	3.00	25	33	19	0.4	14	CL	-

APPENDIX 3

LUGEON TEST SUMMARY AND TEST INTERPRETATION SHEETS



Qualitas

Lugeon Test Summary - BH15-TMF-01

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Test Interval Top Bottom	Graphs			Result																				
2.370 m 4.270 m	<table border="1"> <caption>Pressure [bar] vs Step</caption> <tr><th>Step</th><th>Pressure [bar]</th></tr> <tr><td>1</td><td>0.25</td></tr> <tr><td>2</td><td>0.45</td></tr> <tr><td>3</td><td>0.25</td></tr> </table>	Step	Pressure [bar]	1	0.25	2	0.45	3	0.25	<table border="1"> <caption>Flow [l/s] vs Pressure [bar]</caption> <tr><th>Step</th><th>Pressure [bar]</th><th>Flow [l/s]</th></tr> <tr><td>1</td><td>0.25</td><td>0.00</td></tr> <tr><td>2</td><td>0.45</td><td>0.00</td></tr> <tr><td>3</td><td>0.25</td><td>0.00</td></tr> </table>	Step	Pressure [bar]	Flow [l/s]	1	0.25	0.00	2	0.45	0.00	3	0.25	0.00		Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
Step	Pressure [bar]																							
1	0.25																							
2	0.45																							
3	0.25																							
Step	Pressure [bar]	Flow [l/s]																						
1	0.25	0.00																						
2	0.45	0.00																						
3	0.25	0.00																						
4.270 m 6.170 m	<table border="1"> <caption>Pressure [bar] vs Step</caption> <tr><th>Step</th><th>Pressure [bar]</th></tr> <tr><td>1</td><td>0.5</td></tr> <tr><td>2</td><td>0.8</td></tr> <tr><td>3</td><td>0.5</td></tr> </table>	Step	Pressure [bar]	1	0.5	2	0.8	3	0.5	<table border="1"> <caption>Flow [l/s] vs Pressure [bar]</caption> <tr><th>Step</th><th>Pressure [bar]</th><th>Flow [l/s]</th></tr> <tr><td>1</td><td>0.5</td><td>0.00</td></tr> <tr><td>2</td><td>0.8</td><td>0.00</td></tr> <tr><td>3</td><td>0.5</td><td>0.00</td></tr> </table>	Step	Pressure [bar]	Flow [l/s]	1	0.5	0.00	2	0.8	0.00	3	0.5	0.00		Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
Step	Pressure [bar]																							
1	0.5																							
2	0.8																							
3	0.5																							
Step	Pressure [bar]	Flow [l/s]																						
1	0.5	0.00																						
2	0.8	0.00																						
3	0.5	0.00																						
6.170 m 7.670 m	<table border="1"> <caption>Pressure [bar] vs Step</caption> <tr><th>Step</th><th>Pressure [bar]</th></tr> <tr><td>1</td><td>0.7</td></tr> <tr><td>2</td><td>1.0</td></tr> <tr><td>3</td><td>0.7</td></tr> </table>	Step	Pressure [bar]	1	0.7	2	1.0	3	0.7	<table border="1"> <caption>Flow [l/s] vs Pressure [bar]</caption> <tr><th>Step</th><th>Pressure [bar]</th><th>Flow [l/s]</th></tr> <tr><td>1</td><td>0.7</td><td>0.00</td></tr> <tr><td>2</td><td>1.0</td><td>0.00</td></tr> <tr><td>3</td><td>0.7</td><td>0.00</td></tr> </table>	Step	Pressure [bar]	Flow [l/s]	1	0.7	0.00	2	1.0	0.00	3	0.7	0.00		Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
Step	Pressure [bar]																							
1	0.7																							
2	1.0																							
3	0.7																							
Step	Pressure [bar]	Flow [l/s]																						
1	0.7	0.00																						
2	1.0	0.00																						
3	0.7	0.00																						

Lugeon Test Analysis Report

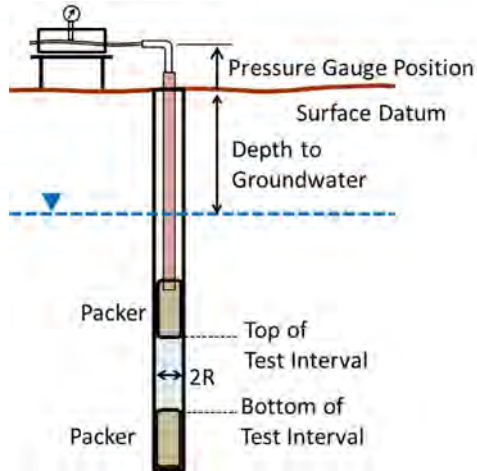
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

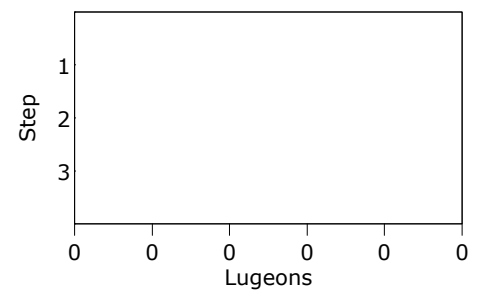
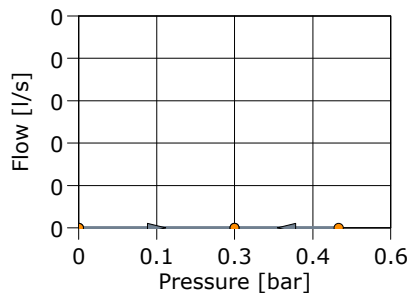
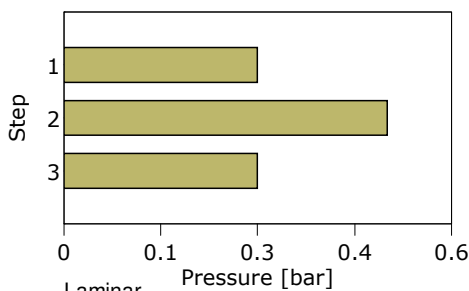
Location: Concentrator Site	Lugeon Test: BH15-TMF-01 (2.37-4.27 m)	Tested bore: BH15-TMF-01
Test Conducted by: AT		Test Date: 2015-10-08
Analysis Performed by: MC 127780		Analysis Date: 2015-11-20

Lithology: granite



Top of Test Interval: 2.370 m
 Bottom of Test Interval: 4.270 m
 Length of Test Interval: 1.900 m
 Gauge Position: 1.100 m
 Depth to Groundwater: 0.510 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]				Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4		[cm/s]	[m/s]	Lugeon
1	0.3	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.5	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	0.3	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average							0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s

Lugeon Test Analysis Report

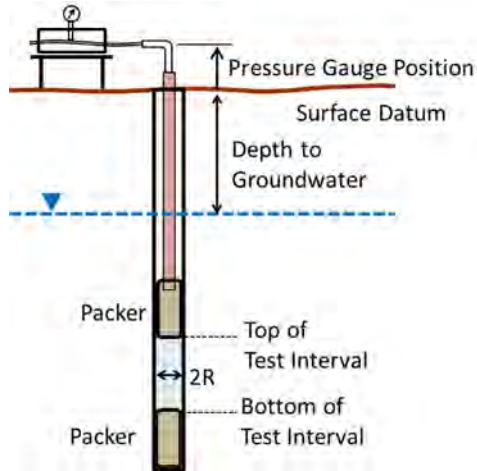
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

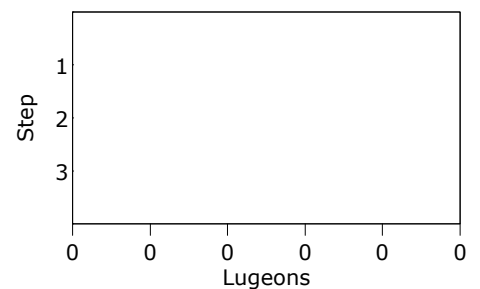
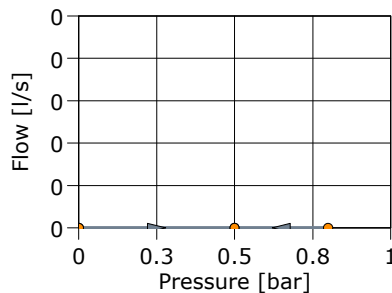
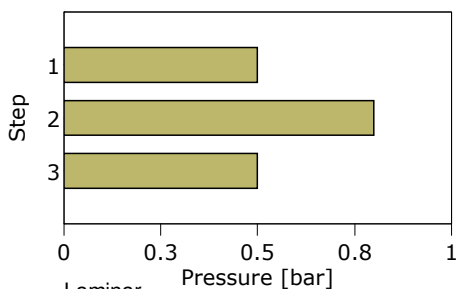
Location: Concentrator Site	Lugeon Test: BH15-TMF-01 (4.27-6.17 m)	Tested bore: BH15-TMF-01
Test Conducted by: AT		Test Date: 2015-10-08
Analysis Performed by: MC 127780		Analysis Date: 2015-11-20

Lithology: granite



Top of Test Interval: 4.270 m
 Bottom of Test Interval: 6.170 m
 Length of Test Interval: 1.900 m
 Gauge Position: 1.100 m
 Depth to Groundwater: 0.510 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]				Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4		[cm/s]	[m/s]	Lugeon
1	0.5	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.8	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	0.5	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average							0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s

Lugeon Test Analysis Report

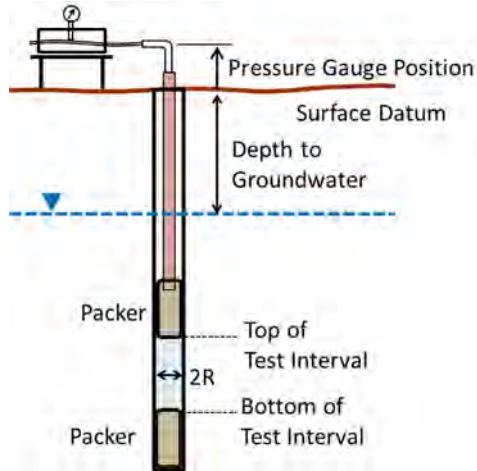
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

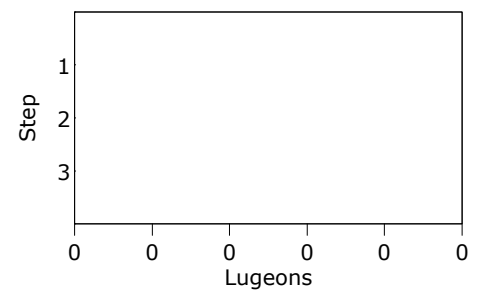
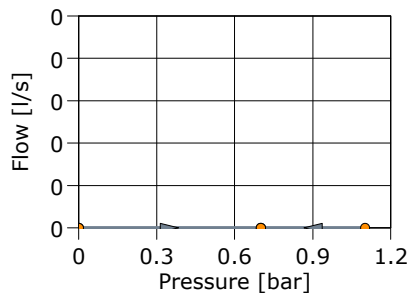
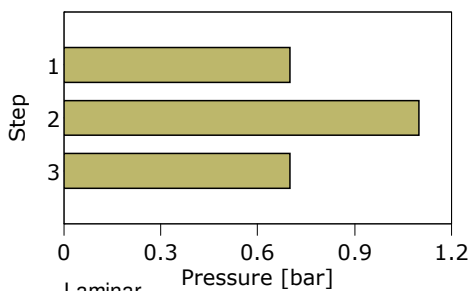
Location: Concentrator Site	Lugeon Test: BH15-TMF-01 (6.17-7.67 m)	Tested bore: BH15-TMF-01
Test Conducted by: AT		Test Date: 2015-10-08
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21

Lithology: granite



Top of Test Interval: 6.170 m
 Bottom of Test Interval: 7.670 m
 Length of Test Interval: 1.500 m
 Gauge Position: 1.100 m
 Depth to Groundwater: 0.510 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]				Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4		[cm/s]	[m/s]	Lugeon
1	0.7	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	1.1	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	0.7	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average							0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s



Qualitas

Lugeon Test Summary - BH15-TMF-02

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Test Interval Top Bottom	Graphs			Result
3.390 m 5.290 m				Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00 m/s
5.290 m 6.190 m				Dilation Lugeon: 21.6 Hydraulic Conductivity: 1.78E-4 cm/s Hydraulic Conductivity: 1.78E-6 m/s
7.190 m 9.260 m				Dilation Lugeon: 7.0 Hydraulic Conductivity: 7.29E-5 cm/s Hydraulic Conductivity: 7.29E-7 m/s

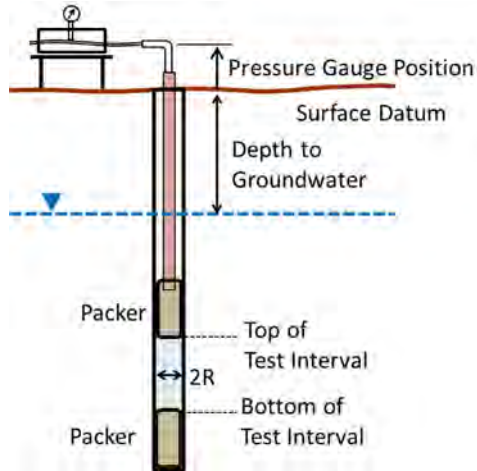
Lugeon Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

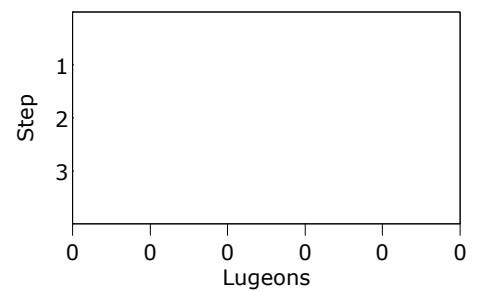
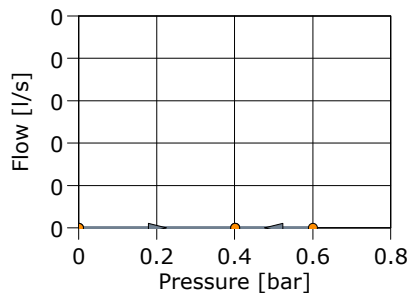
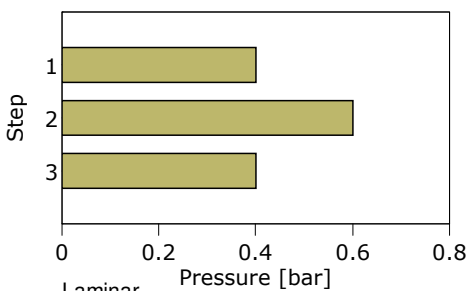
Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site	Lugeon Test: BH15-TMF-02 (3.39-5.29 m)	Tested bore: BH15-TMF-02
Test Conducted by: AT		Test Date: 2015-10-13
Analysis Performed by: MC 127780		Analysis Date: 2015-11-20
Lithology: granitic gneiss		



Top of Test Interval: 3.390 m
 Bottom of Test Interval: 5.290 m
 Length of Test Interval: 1.900 m
 Gauge Position: 0.900 m
 Depth to Groundwater: 0.140 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.4	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00	0.0
2	0.6	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00	0.0
3	0.4	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00	0.0
Average								0.00×10^0	0.00	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00 m/s

Lugeon Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site

Lugeon Test: BH15-TMF-02 (5.29-6.19 m)

Tested bore: BH15-TMF-02

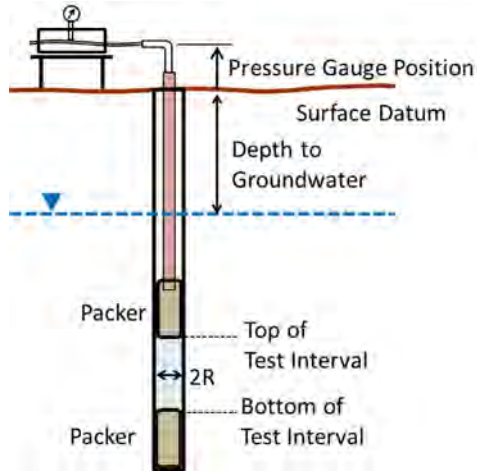
Test Conducted by: AT

Test Date: 2015-10-13

Analysis Performed by: MC 127780

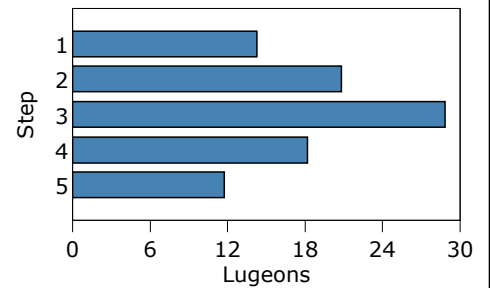
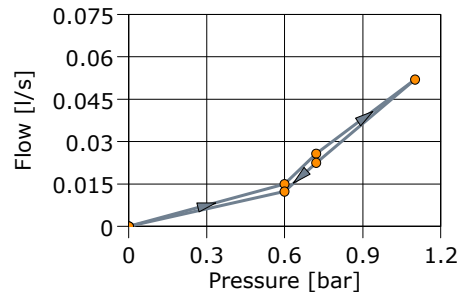
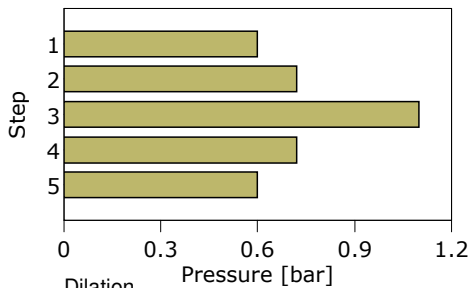
Analysis Date: 2015-11-20

Lithology: granitic gneiss



Top of Test Interval: 5.290 m
 Bottom of Test Interval: 6.190 m
 Length of Test Interval: 0.900 m
 Gauge Position: 0.900 m
 Depth to Groundwater: 0.140 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.6	0.015	0.015	0.015	0.015	0.015	0.015	1.17×10^{-4}	1.17×10^{-6}	14.2
2	0.7	0.028	0.025	0.025	0.025	0.025	0.026	1.71×10^{-4}	1.71×10^{-6}	20.8
3	1.1	0.053	0.052	0.050	0.053	0.052	0.052	2.37×10^{-4}	2.37×10^{-6}	28.8
4	0.7	0.023	0.022	0.023	0.022	0.022	0.022	1.50×10^{-4}	1.50×10^{-6}	18.2
5	0.6	0.012	0.013	0.012	0.013	0.012	0.012	9.70×10^{-5}	9.70×10^{-7}	11.8
Average								1.54×10^{-4}	1.54×10^{-6}	18.8



Dilatation
 Lugeon: 21.6
 Hydraulic Conductivity: 1.78×10^{-4} cm/s
 Hydraulic Conductivity: 1.78×10^{-6} m/s

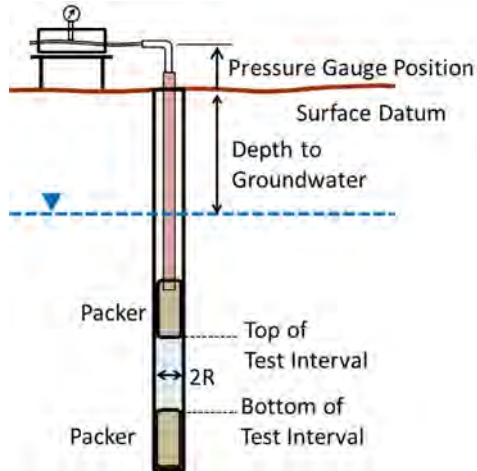
Lugeon Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

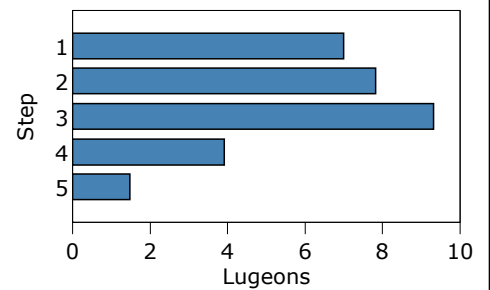
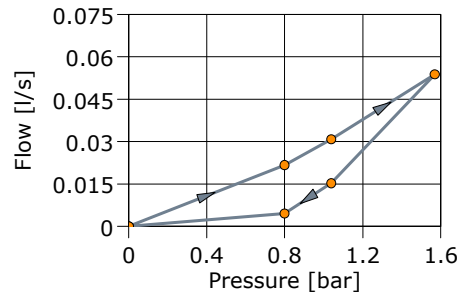
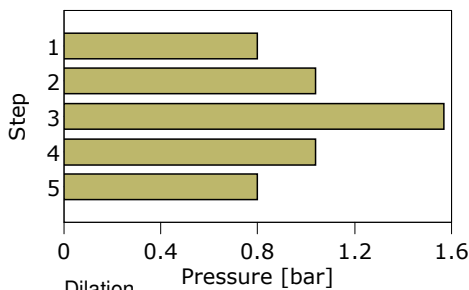
Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site	Lugeon Test: BH15-TMF-02 (7.19-9.26 m)	Tested bore: BH15-TMF-02
Test Conducted by: KS		Test Date: 2015-10-13
Analysis Performed by: MC 127780		Analysis Date: 2015-11-20
Lithology: granitic gneiss		



Top of Test Interval: 7.190 m
 Bottom of Test Interval: 9.260 m
 Length of Test Interval: 2.070 m
 Gauge Position: 0.900 m
 Depth to Groundwater: 0.140 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.8	0.022	0.023	0.020	0.022	0.022	0.022	7.29×10^{-5}	7.29×10^{-7}	7.0
2	1.0	0.032	0.030	0.030	0.030	0.032	0.031	8.13×10^{-5}	8.13×10^{-7}	7.8
3	1.6	0.055	0.053	0.053	0.055	0.053	0.054	9.70×10^{-5}	9.70×10^{-7}	9.3
4	1.0	0.017	0.015	0.015	0.015	0.015	0.015	4.06×10^{-5}	4.06×10^{-7}	3.9
5	0.8	0.005	0.003	0.005	0.005	0.005	0.005	1.54×10^{-5}	1.54×10^{-7}	1.5
Average								6.14×10^{-5}	6.14×10^{-7}	5.9



Dilation
 Lugeon: 7.0
 Hydraulic Conductivity: 7.29×10^{-5} cm/s
 Hydraulic Conductivity: 7.29×10^{-7} m/s



Qualitas

Lugeon Test Summary - BH15-TMF-03

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Test Interval Top Bottom	Graphs			Result																				
1.400 m 3.300 m	<table border="1"> <caption>Pressure [bar] vs Step</caption> <tr><th>Step</th><th>Pressure [bar]</th></tr> <tr><td>1</td><td>0.18</td></tr> <tr><td>2</td><td>0.28</td></tr> </table>	Step	Pressure [bar]	1	0.18	2	0.28	<table border="1"> <caption>Flow [l/s] vs Pressure [bar]</caption> <tr><th>Step</th><th>Pressure [bar]</th><th>Flow [l/s]</th></tr> <tr><td>1</td><td>0.18</td><td>0.00</td></tr> <tr><td>2</td><td>0.28</td><td>0.00</td></tr> </table>	Step	Pressure [bar]	Flow [l/s]	1	0.18	0.00	2	0.28	0.00		Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s					
Step	Pressure [bar]																							
1	0.18																							
2	0.28																							
Step	Pressure [bar]	Flow [l/s]																						
1	0.18	0.00																						
2	0.28	0.00																						
3.300 m 5.200 m	<table border="1"> <caption>Pressure [bar] vs Step</caption> <tr><th>Step</th><th>Pressure [bar]</th></tr> <tr><td>1</td><td>0.45</td></tr> <tr><td>2</td><td>0.55</td></tr> <tr><td>3</td><td>0.85</td></tr> </table>	Step	Pressure [bar]	1	0.45	2	0.55	3	0.85	<table border="1"> <caption>Flow [l/s] vs Pressure [bar]</caption> <tr><th>Step</th><th>Pressure [bar]</th><th>Flow [l/s]</th></tr> <tr><td>1</td><td>0.45</td><td>0.00</td></tr> <tr><td>2</td><td>0.55</td><td>0.00</td></tr> <tr><td>3</td><td>0.85</td><td>0.00</td></tr> </table>	Step	Pressure [bar]	Flow [l/s]	1	0.45	0.00	2	0.55	0.00	3	0.85	0.00		Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
Step	Pressure [bar]																							
1	0.45																							
2	0.55																							
3	0.85																							
Step	Pressure [bar]	Flow [l/s]																						
1	0.45	0.00																						
2	0.55	0.00																						
3	0.85	0.00																						
5.200 m 7.600 m	<table border="1"> <caption>Pressure [bar] vs Step</caption> <tr><th>Step</th><th>Pressure [bar]</th></tr> <tr><td>1</td><td>0.65</td></tr> <tr><td>2</td><td>0.95</td></tr> <tr><td>3</td><td>1.25</td></tr> </table>	Step	Pressure [bar]	1	0.65	2	0.95	3	1.25	<table border="1"> <caption>Flow [l/s] vs Pressure [bar]</caption> <tr><th>Step</th><th>Pressure [bar]</th><th>Flow [l/s]</th></tr> <tr><td>1</td><td>0.65</td><td>0.00</td></tr> <tr><td>2</td><td>0.95</td><td>0.00</td></tr> <tr><td>3</td><td>1.25</td><td>0.00</td></tr> </table>	Step	Pressure [bar]	Flow [l/s]	1	0.65	0.00	2	0.95	0.00	3	1.25	0.00		Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
Step	Pressure [bar]																							
1	0.65																							
2	0.95																							
3	1.25																							
Step	Pressure [bar]	Flow [l/s]																						
1	0.65	0.00																						
2	0.95	0.00																						
3	1.25	0.00																						

Lugeon Test Analysis Report

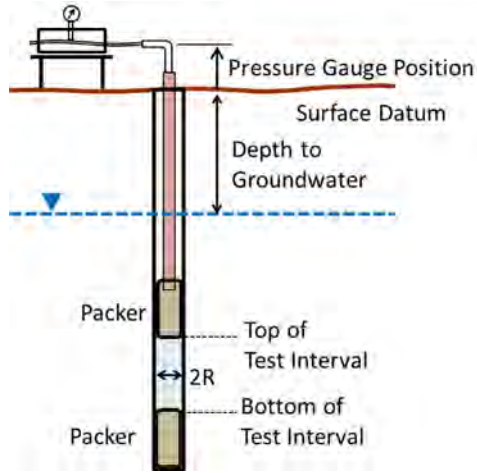
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

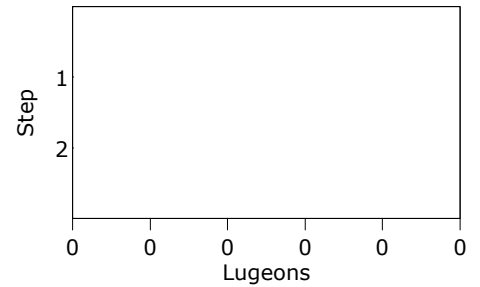
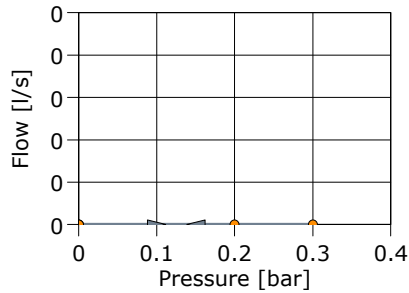
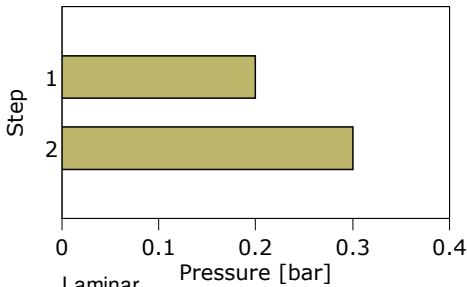
Location: Concentrator Site	Lugeon Test: BH15-TMF-03 (1.40-3.30 m)	Tested bore: BH15-TMF-03
Test Conducted by: AT		Test Date: 2015-10-11
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21

Lithology: granitic gneiss



Top of Test Interval: 1.400 m
 Bottom of Test Interval: 3.300 m
 Length of Test Interval: 1.900 m
 Gauge Position: 0.910 m
 Depth to Groundwater: 0.510 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.3	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average								0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s

Lugeon Test Analysis Report

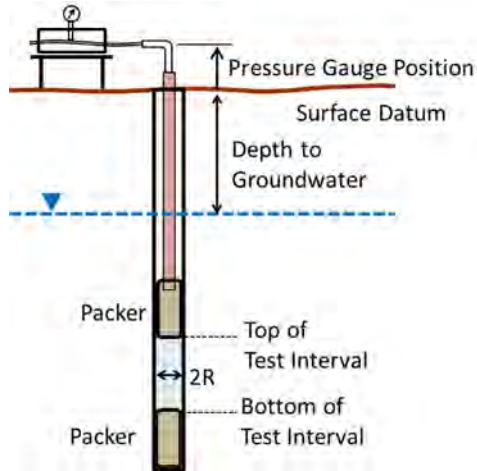
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

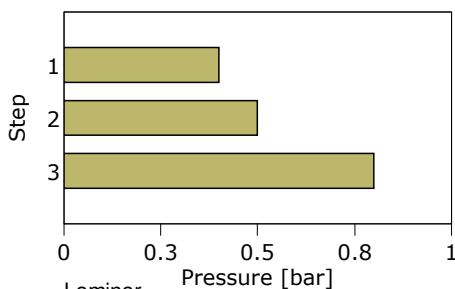
Location: Concentrator Site	Lugeon Test: BH15-TMF-03 (3.30-5.20 m)	Tested bore: BH15-TMF-03
Test Conducted by: AT		Test Date: 2015-10-11
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21

Lithology: granitic gneiss

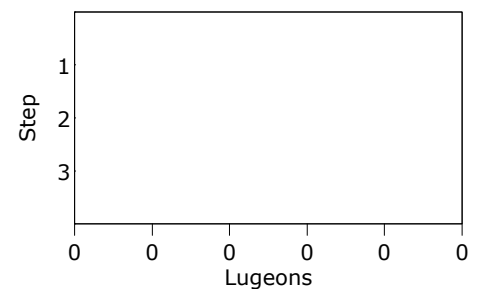
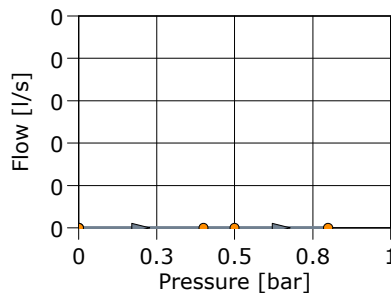


Top of Test Interval: 3.300 m
 Bottom of Test Interval: 5.200 m
 Length of Test Interval: 1.900 m
 Gauge Position: 0.910 m
 Depth to Groundwater: 0.510 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.4	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.5	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	0.8	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average								0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s



Lugeon Test Analysis Report

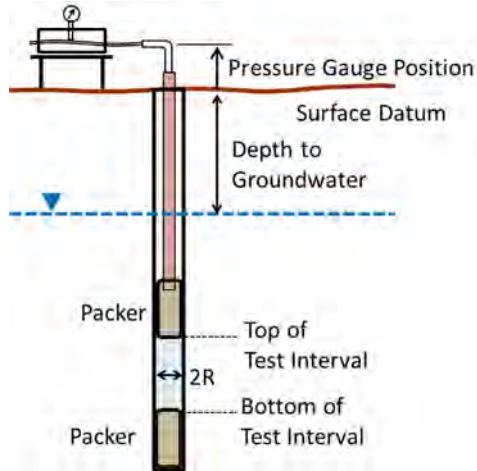
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

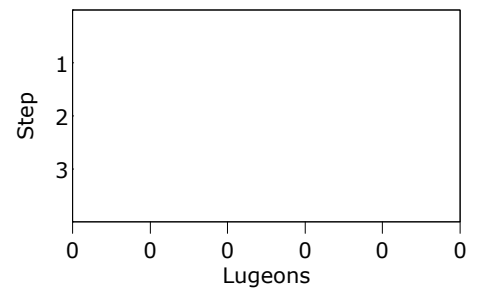
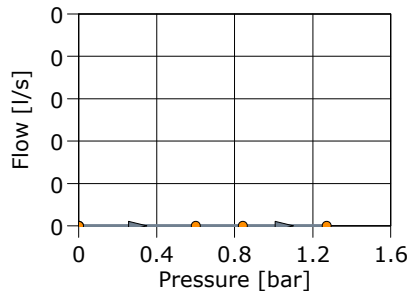
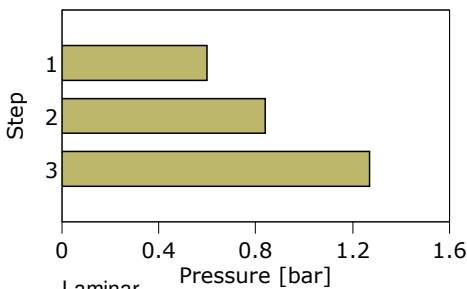
Location: Concentrator Site	Lugeon Test: BH15-TMF-03 (5.20-7.60 m)	Tested bore: BH15-TMF-03
Test Conducted by: AT		Test Date: 2015-10-11
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21

Lithology: granitic gneiss



Top of Test Interval: 5.200 m
 Bottom of Test Interval: 7.600 m
 Length of Test Interval: 2.400 m
 Gauge Position: 0.910 m
 Depth to Groundwater: 0.510 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.6	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.8	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	1.3	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average								0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s



Qualitas

Lugeon Test Summary - BH15-TMF-04

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Test Interval Top Bottom	Graphs			Result
1.150 m 3.050 m				Dilation Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
3.050 m 4.950 m				Laminar Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s
4.950 m 7.510 m				Dilation Lugeon: 0.0 Hydraulic Conductivity: 0.00E0 cm/s Hydraulic Conductivity: 0.00E0 m/s

Lugeon Test Analysis Report

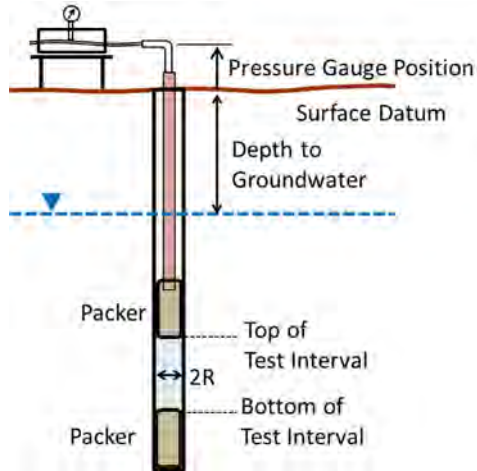
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

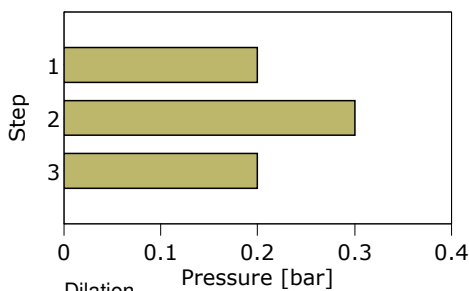
Location: Concentrator Site	Lugeon Test: BH15-TMF-04 (1.15-3.05 m)	Tested bore: BH15-TMF-04
Test Conducted by: AT		Test Date: 2015-10-09
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21

Lithology: granite

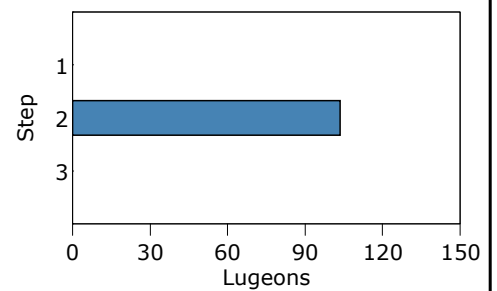
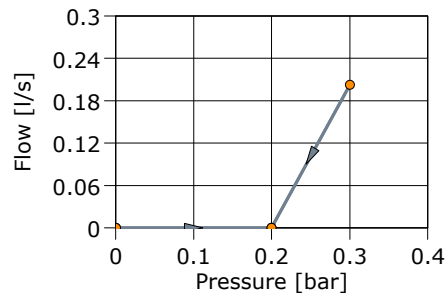


Top of Test Interval: 1.150 m
 Bottom of Test Interval: 3.050 m
 Length of Test Interval: 1.900 m
 Gauge Position: 0.780 m
 Depth to Groundwater: 2.440 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.3	0.217	0.200	0.207	0.193	0.193	0.202	1.05×10^{-3}	1.05×10^{-5}	103.6
3	0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average								3.51×10^{-4}	3.51×10^{-6}	34.5



Dilation
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s



Lugeon Test Analysis Report

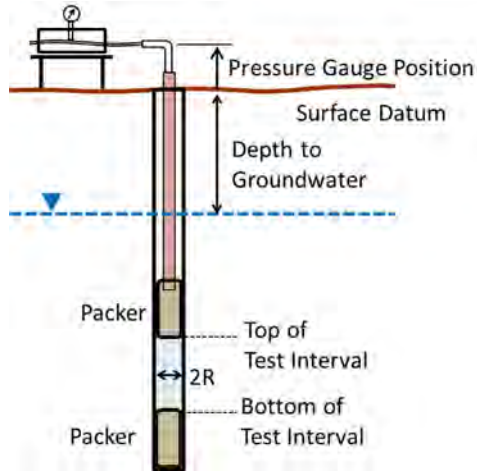
Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

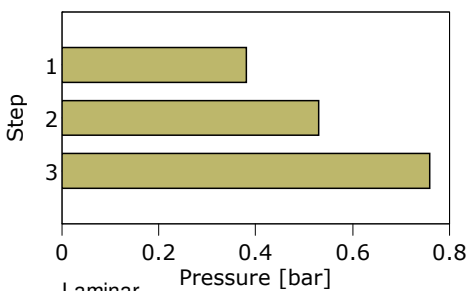
Location: Concentrator Site	Lugeon Test: BH15-TMF-04 (3.05-4.95 m)	Tested bore: BH15-TMF-04
Test Conducted by: AT		Test Date: 2015-10-09
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21

Lithology: granite

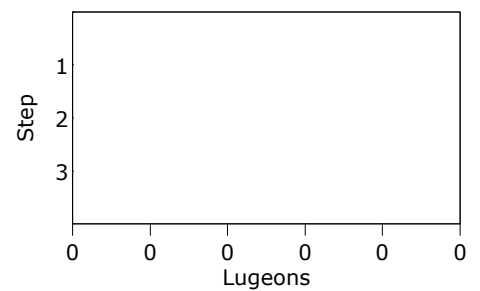
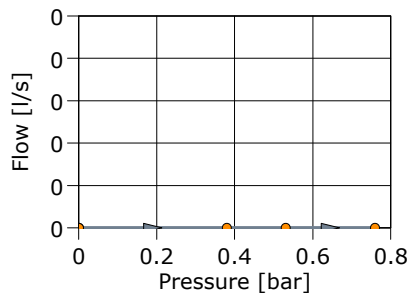


Top of Test Interval: 3.050 m
 Bottom of Test Interval: 4.950 m
 Length of Test Interval: 1.900 m
 Gauge Position: 0.780 m
 Depth to Groundwater: 2.440 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.4	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.5	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	0.8	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average								0.00×10^0	0.00×10^0	0.0



Laminar
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s



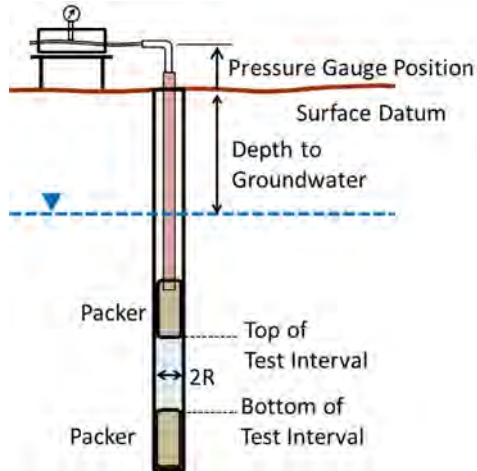
Lugeon Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

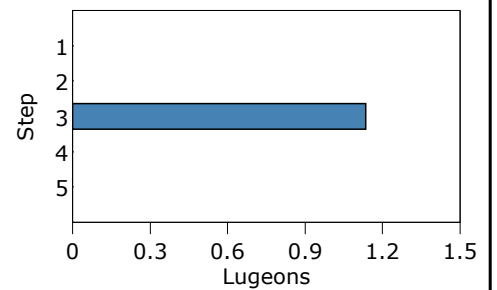
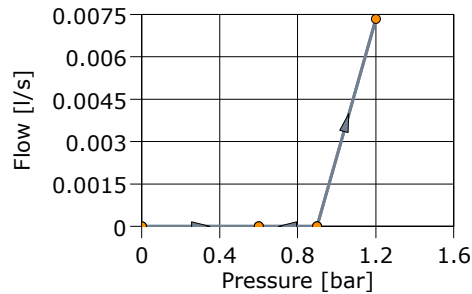
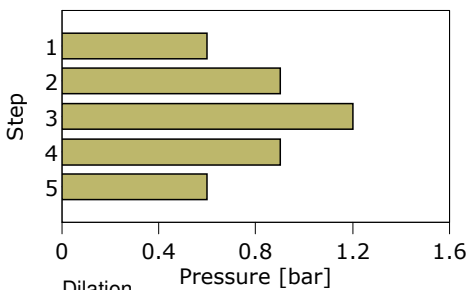
Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site	Lugeon Test: BH15-TMF-04 (4.95-7.51 m)	Tested bore: BH15-TMF-04
Test Conducted by: AT		Test Date: 2015-10-09
Analysis Performed by: MC 127780		Analysis Date: 2015-11-21
Lithology: granite		



Top of Test Interval: 4.950 m
 Bottom of Test Interval: 7.510 m
 Length of Test Interval: 2.560 m
 Gauge Position: 0.780 m
 Depth to Groundwater: 2.440 m
 Radius of Test Section: 0.038 m

Step	Pressure [bar]	Flow Meter Readings [l/s]					Average Flow Rate [l/s]	Hydraulic Conductivity		
		1	2	3	4	5		[cm/s]	[m/s]	Lugeon
1	0.6	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
2	0.9	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
3	1.2	0.007	0.008	0.007	0.007	0.008	0.007	1.24×10^{-5}	1.24×10^{-7}	1.1
4	0.9	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
5	0.6	0.000	0.000	0.000	0.000	0.000	0.000	0.00×10^0	0.00×10^0	0.0
Average								2.49×10^{-6}	2.49×10^{-8}	0.2



Dilation
 Lugeon: 0.0
 Hydraulic Conductivity: 0.00E0 cm/s
 Hydraulic Conductivity: 0.00E0 m/s

APPENDIX 4

SLUG TEST INTERPRETATION SHEETS



Qualitas

Slug Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site

Slug Test: BH15-TMF-02

Test Well: BH15-TMF-02

Test Conducted by: KS

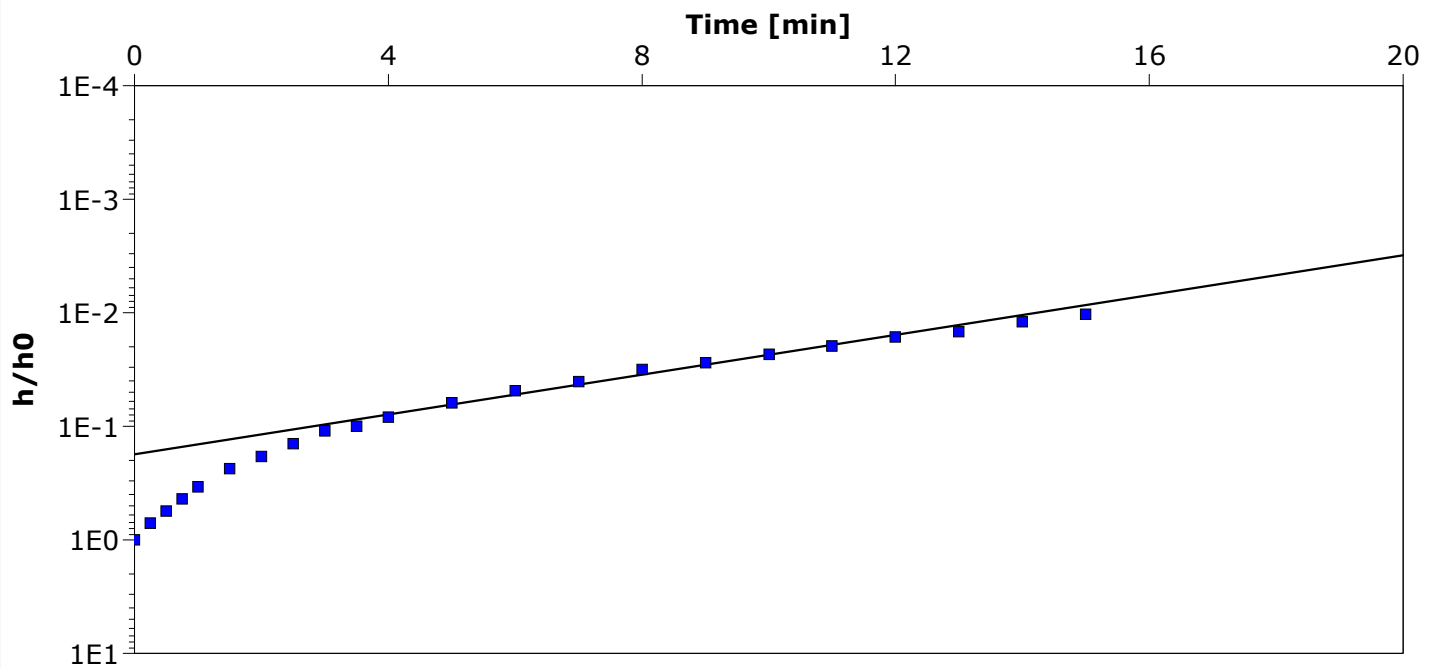
Test Date: 2015-10-17

Analysis Performed by: SF, MC

BH15-TMF-02

Analysis Date: 2015-11-20

Aquifer Thickness: 0.46 m



Calculation using Hvorslev

Observation Well

Hydraulic Conductivity
[cm/s]

BH15-TMF-02

6.80×10^{-3}



Qualitas

Slug Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site

Slug Test: BH15-TMF-03

Test Well: BH15-TMF-03

Test Conducted by: KS

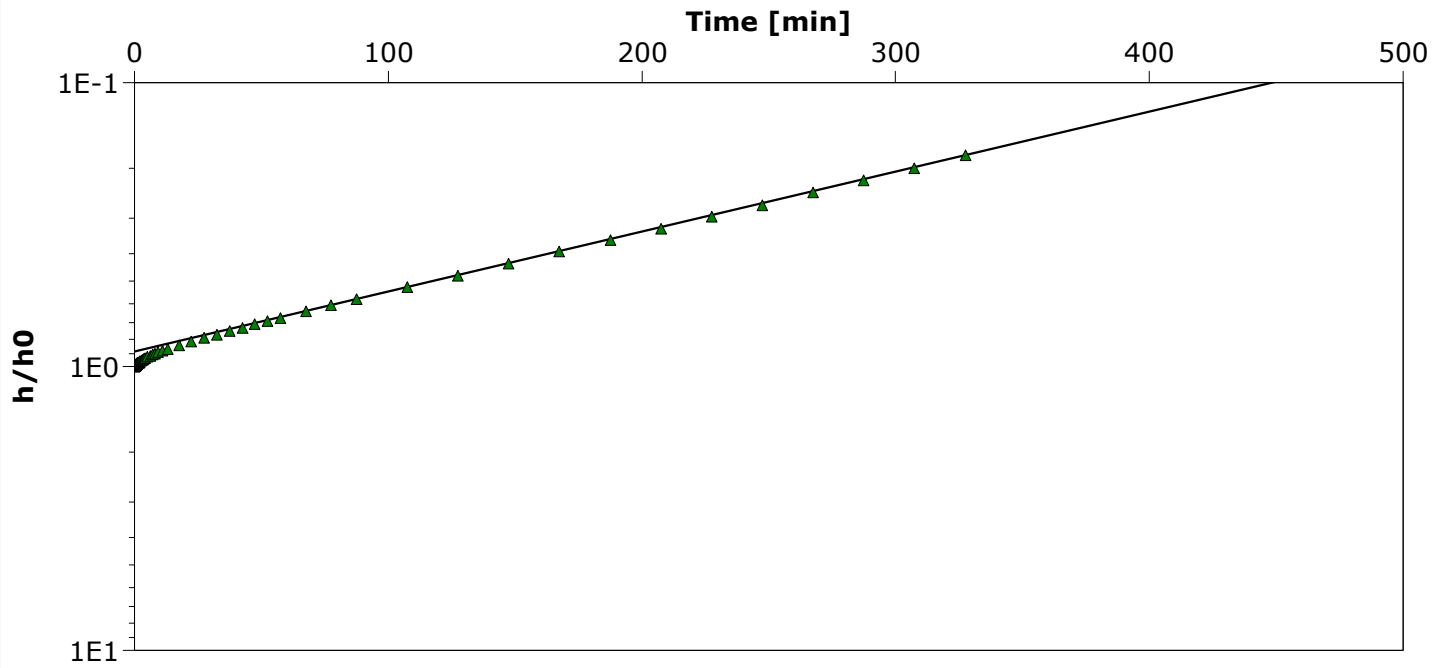
Test Date: 2015-10-17

Analysis Performed by: SF, MC

BH15-TMF-03

Analysis Date: 2015-11-20

Aquifer Thickness: 6.25 m



Calculation using Hvorslev

Observation Well

Hydraulic Conductivity
[cm/s]

BH15-TMF-03

4.94×10^{-5}



Qualitas

Slug Test Analysis Report

Project: Preliminary Geotechnical Investigation

Number: 632622.2

Client: Mason Graphite inc./ Hatch Ltée.

Location: Concentrator Site

Slug Test: BH15-TMF-04

Test Well: BH15-TMF-04

Test Conducted by: KS

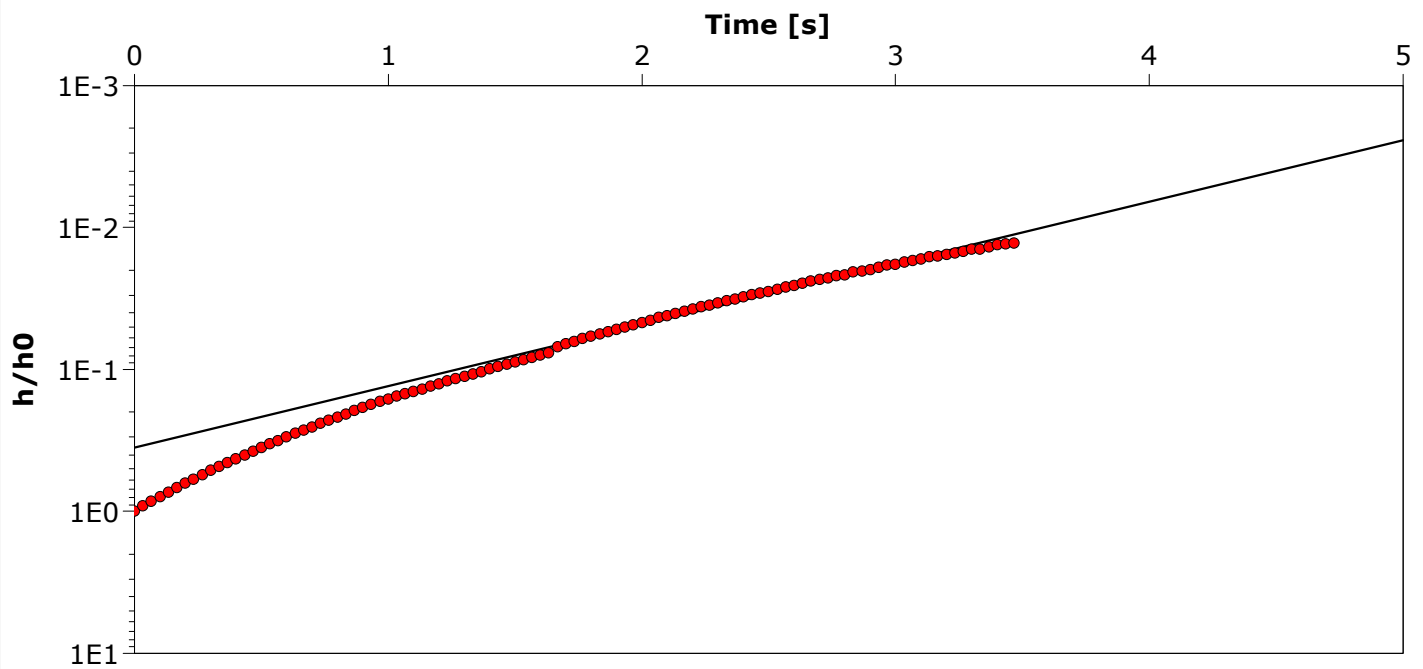
Test Date: 2015-10-17

Analysis Performed by: SF, MC

BH15-TMF-04

Analysis Date: 2015-11-21

Aquifer Thickness: 4.08 m



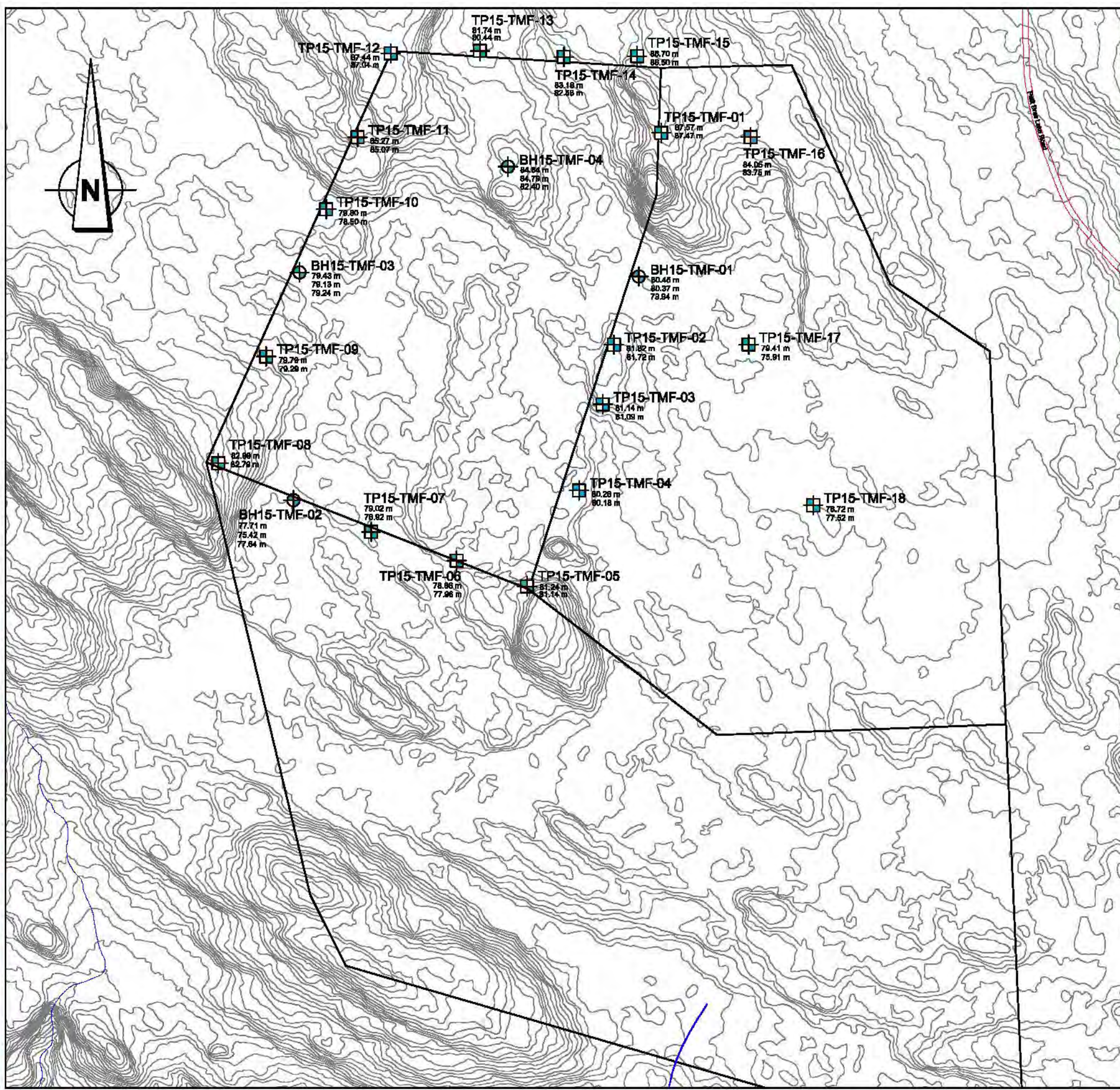
Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]
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BH15-TMF-04	5.78×10^{-3}
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APPENDIX 5

DRAWING 632622.02-01 – SOUNDING LOCATION PLAN



LEGEND

- Borehole 2015**
Elevation of surface (m)
Bedrock elevation (m)
Water level elevation (m)
- Test Pit 2015**
Elevation of surface (m)
Bedrock elevation (m)
- Projected TMF position**
- Water line**
- Intermittent stream**
- Contour line (m)**

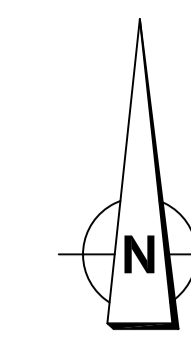
Reference:
Topographic data from LIDAR survey provided by HATCH Ltd.

CLIENT:	Mason Graphite / Hatch Ltd	
PROJECT:	Preliminary Geotechnical Investigation Concentrator Site	
LOCATION:	Baie-Comeau, Quebec	
TITLE:	Sounding Location Plan Tailings Management Facility (TMF)	
SCALE:	1 : 3000	
DATE:	FILE:	DRAWING:
2015-11-24	632622.2	632622.2-01

F:\DORACLE\DOSSIERS\632622 - Mason Graphite Concentrateur\Deasin\632622 localisation.dwg

APPENDIX 6

GEOLOGICAL MAPPING AND PHOTOGRAPHIC REPORT



O25	Family 1	Family 2	Family 3
Outcrop nature	Pink granite		
General dip	90°	90°	0°
General azimuth	18°	98°	0°
Joint spacing (m)	0.1 to 0.5	N/D	0.2

O17	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	150°	76°
Joint spacing (m)	NA	NA

O14	Family 1
Outcrop nature	Gabbro
General dip	30°
General azimuth	287°
Joint spacing (m)	NA

O23	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	66°	346°
Joint spacing (m)	NA	NA

O24	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	90°
General azimuth	350°	98°
Joint spacing (m)	NA	NA

O11	Family 1	Family 2
Outcrop nature	Granitic	
General dip	90°	0°
General azimuth	242°	0°
Joint spacing (m)	0.2 to 0.4	NA

LEGEND

Borehole 2015 Elevation of surface (m) Bedrock elevation (m)	Projected TMF position	Peat bog
Test-Pit 2015 Elevation of surface (m) Bedrock elevation (m)	Water line	Outcrop
Rocky escarpment	Intermittent stream	Shallow rock
	Contour line (m)	Forest
	NA Not available	
	Orientation view of the picture	
	O3 Observation number	

Notes:
 1- This drawing must be consulted with the photographic report provided in report 632622.2.
 2- The limit of each zone were interpreted and estimated using field observations and the LIDAR survey.
 3- The GPS points were surveyed using a Garmin GPS (+/- 10 m of precision).

Reference:
 Topographic data from LIDAR survey provided by HATCH Ltd.

Qualitas

CLIENT: Mason Graphite Inc. / Hatch Ltd

PROJECT: Preliminary Geotechnical Investigation Concentrator site

LOCATION: Baie-Comeau, Quebec

TITLE: Geological Mapping Tailing Management Facility (TMF)

SCALE: 1 : 1500

DATE: 2015-11-24	FILE: 632622.2	DRAWING: 632622.2-02
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CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 1 (GPS no. 191):
Shallow bedrock zone.



General view of the area in the East direction.

Observation 2 (GPS no. 193):
Shallow bedrock and outcrop zone.



General view in the North direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 3 (GPS no. 194):

Shallow bedrock zone.



General view of the area in the South direction.

Observation 4 (GPS no. 197):

Shallow bedrock zone.



General view in the North-East direction. Presence of a boulder (max. diameter: 0.75 m).

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 5 (GPS no. 198):

Peat bog zone.



General view of the area in the South-East direction. Approximately 0.50 m of peat.

Observation 6 (GPS no. 199):

Shallow bedrock zone



General view in the West direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 7 (GPS no. 199):

Shallow bedrock zone.



General view in the East direction.

Observation 8 (GPS no. 200):

Peat bog zone.



General view in the North direction. Accumulation of at least 1 m of peat.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 9 (GPS no. 220):

Intermittent stream of 0.3 m in width in a peat bog zone.



General view of the area in the North direction.

Observation 10 (GPS no. 220):

Intermittent stream of 0.3 m in width in a peat bog zone.



General view in the South direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 11 (GPS no. 224):

Local outcrop.



General view of the area in the North direction.

Observation 12 (GPS no. 193, 194):

Peat bog zone with approximately 0.25 m of peat.



General view to the North direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 13 (GPS no. 234):

Shallow bedrock and outcrop zone; pink color of granitic nature.



General view of the area in the North direction.

Observation 14 (GPS no. 237):

Local outcrop.



View in the North direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 15 (GPS no. 238):

Shallow bedrock and outcrop zone.



General view of the area in the North direction.

Observation 16 (GPS no. 242):

Forest area. Contact between two lithologies (not visible on the picture).



General view in the West direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 17 (GPS no. 246):

Outcrop zone.



General view of the area in the East direction.

Observation 18 (GPS no. 248):

Outcrop zone (right) and peat bog zone (left).



General view in the North direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 19 (GPS no. 249):

Shallow bedrock zone.



General view of the area in the South-West direction.

Observation 20 (GPS no. 256):

Shallow bedrock and peat bog zone near BH15-TMF-02 (shown on the picture).



General view in the West direction.

CLIENT: Mason Graphite / Hatch Ltée.
PROJECT : Preliminary Geotechnical Investigation
LOCATION : Concentrator Site, Baie-Comeau, Quebec
QUALITAS FILE NO : 632622.2

Observation 21 (GPS no. 259):

Shallow bedrock and outcrop zone.



General view of the area in the North direction.

Observation 22 (GPS no. 266):

Contact between two lithologies.



General view in the East direction.

APPENDIX 7

BENCHMARK SPECIFICATIONS

DESCRIPTION STATION PERMANENTE

No. POINT: ST-1		DATE: 2013-08-13		ACCÈS ET SITUATION: Le point est situé sur le côté droit de l'avenue Du Labrador, à Baie-Comeau, au chaînage 0+650
PROJET: 154-09-0118	BALISAGE: Plaque sur poteau de bois		HAUTEUR: N/A	
COORDONNÉES: NAD 83 (SCRS)				TRANSPORT: Automobile
LATITUDE:		N/A		
LONGITUDE:		N/A		
COORDONNÉES :SCOPQ NAD83 (SCRS)				
FUSEAU 6				
Y	5 453 338.317			
X	251 323.527			
Z	69.567			
TYPE DE REPÈRE: Médaillon de Zinc				



PAR : Groupe Cadoret, Arpenteurs-Géomètres

DATE: 19 septembre 2013

APPENDIX 8

SCOPE OF THE REPORT

SCOPE OF THE REPORT

GENERAL

This report has been prepared in accordance with the terms of reference of the task assigned to Groupe Qualitas Inc. and on the belief that the design of the structures will be in conformity with the standards and codes in force. If the project design, site or elevation is changed, Groupe Qualitas Inc. shall be consulted in order to confirm the validity of the recommendations made in this report or to change them if required.

The recommendations made in this report are only intended for the designers during the design phase. The number of test holes to determine all the relevant subsurface conditions that may affect the construction costs, the choice of the job site equipment and techniques, the schedule and sequence of the project work or any other consideration related to the construction itself, should normally be greater than the number of test holes made only for design purposes. The contractors, who are bidding or who will be carrying out the works, will have to take into account the limited scope of this report and they will have to rely on their own investigations and on their own interpretation of the test hole results to determine how the subsurface conditions may affect their works.

FOLLOW-UP OF DESIGN AND WORKS

Not all the design and construction details may be known when Groupe Qualitas Inc. submits its report. Therefore, it is recommended that the services of Groupe Qualitas Inc. be consulted during the final design stage to revise the design drawings and the specifications relating to the foundations, the earthwork, the soil retaining and drainage systems, to check and make sure that from a geotechnical viewpoint they are consistent with the report. If such a revision was impossible, Groupe Qualitas Inc. will not assume any responsibility for the interpretation by third parties of the recommendations made in the report and in particular if the final design differs from the design that has been reviser.

It is recommended to use Groupe Qualitas Inc. services during the construction period to confirm and establish that the subsurface conditions over the whole site area do not differ from those specified in Groupe Qualitas Inc. report, and to confirm and establish that the construction work has not had an adverse effect regarding the recommendations made in this report.

SUBSURFACE CONDITIONS

The soil formations change over a more or less large area. The borehole records merely indicate the approximate conditions of the formations at the location of the test hole. The contacts between the various layers given in the records often are not of a distinct nature, they rather correspond to transition zones, and therefore they formed the subject of interpretation.

The groundwater levels indicated in this report correspond only to those recorded at the location and on the date specified in the report. These conditions may vary according to season or due to construction work on the job site or adjacent sites.

If the conditions found on the site differ significantly from those indicated in this report, either due to the heterogeneous conditions or due to the construction work, the client, as a condition to use the report, shall inform Groupe Qualitas Inc. of the changes involved and shall give them the opportunity to review the recommendations made in this report. Some experience is required to recognize a change in the soil conditions. Therefore, it is recommended that an experienced geotechnical engineer be sent to the site in order to check whether the conditions have changed significantly

The environmental conditions of the site indicated in this report correspond to those detected at the location and the date of the sampling presented in this report. They can vary with time following activities on the subject site, on the adjacent sites or following natural reactions or other events. The concentrations are determined with the chemical analysis results carried out on a limited number of samples. Concentrations can vary between the sampling points. The analytical program was elaborated with the information available at the beginning of the project. This program also takes into account the budget and deadline restrictions. The fact that a parameter was not analyzed does not exclude the presence of a concentration superior to the background level or to the detection limit of this parameter.