FINAL REPORT

GEOTECHNICAL INVESTIGATION AND SUMMARY ENVIRONMENTAL SOIL CHARACTERIZATION

DIRECTIONAL DRILLING FOR THE INSTALLATION OF A PIPE CONNECTED TO A STORM SEWER ON BOULEVARD SAINT-LAURENT NEXT TO MONGEAU STREET
MONTRÉAL, QUÉBEC

CLIENT CODE: **BHP101**
F/N: **UD-19-2742-00**

February 18th, 2020

BHP Experts Conseils S.E.C.

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CONFIDENTIAL
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Note: In this report, all references to the *Soil Protection and Contaminated Site Rehabilitation Guide*, as well as all regulations, guides and guidelines, refer to the most recent literature published by the Ministry of the Environment and the Fight against Climate Change.

1.0 INTRODUCTION

Groupe ABS inc. (ABS) was mandated by Mr. Maxime Latendresse, P.Eng. partner and project director at BHP Experts Conseils S.E.C., to carry out a geotechnical investigation and a summary environmental soil characterization for the installation of a pipe connected to a storm sewer by directional drilling method. The study site is located on Saint-Laurent Boulevard next to Mongeau Street in Montréal. It should be noted that the work extends to the rear parking lot of the building located at 10345 Saint-Laurent Boulevard.

According to our understanding of the mandate, the project consists of the installation of a new sewer pipe under Saint-Laurent Boulevard and the renovation of the parking lot located at the rear of 10345 Saint-Laurent Boulevard. It should be noted that no information was provided regarding the depth of the new pipe. Depending on the depths of analyses requested, the pipe will be placed at a depth of approximately 3.00 m. It should be mentioned that this geotechnical investigation is only for the installation of a pipe by directional drilling and that no recommendation will be made regarding the renovation of the pavement structure.

The purpose of the environmental study is to assess the environmental quality of soils where the work is planned. To do so, results will be compared to the generic criteria of the Ministry of the Environment and the Fight against Climate Change (MEFCC)'s *Guide – Soil Protection and Contaminated Sites Rehabilitation* (Guide) and to the limit values identified in Schedule I of the *Regulation respecting the burial of contaminated soils* (RBCS) for off-site management of excavated materials during work.

This report provides a site description, the drilling methods used during fieldwork, a detailed description of the nature and properties of the soils in place, and the results of geotechnical and chemical analyses. The report also contains geotechnical recommendations for the project and environmental recommendations for soil management during work.

This study was carried out under the terms of the proposal prepared by ABS and dated September 17th, 2019 (F/N: 192742).

2.0 SITE DESCRIPTION

The study site is located on Saint-Laurent Boulevard, at the level of Mongeau Street, in the borough of Ahuntsic-Cartierville. The study site extends to the rear parking lot of the building located at 10345 Saint-Laurent Boulevard. The study site is located in a residential and commercial area. The topography of the site is relatively flat.

Photograph 1 shows a view of the study site as of November 28th, 2019.

Photograph 1: View of the site at borehole 19F01 location – November 28th, 2019

An aerial view of the site as well as its surroundings, taken from the Google Maps website, is shown on the site location plan in Appendix 1.

3.0 INVESTIGATION METHOD

3.1 Surveying work

The layout and locations of the boreholes onsite were chosen by the personnel of ABS in collaboration with the client, with respect to the project needs and the particularities of the study site.

Boreholes were surveyed and their location in NAD83 geodesic coordinates (SCOPQ) x, y, z, was determined using a Trimble GPS unit R8GNSS/R2/TSC3 book. An accuracy of ± 10 mm was obtained for the x and y coordinates, and an accuracy of ± 20 mm was obtained for elevations or z coordinates.

The coordinates of boreholes are shown on the site location plan in Appendix 1 and borehole logs presented in Appendix 2.

3.2 Fieldwork

Fieldwork was carried out on November 28th and 29th, 2019 under the constant supervision of a technician of ABS. The investigation program consisted in the completion of two (2) boreholes identified as 19F01 and 19F02 up to an approximate depth of 4.00 m.

The boreholes were advanced using a tripod-mounted hand drill (drilling unit type M-1). Soil sampling started with the asphalt coring before continuing with two (2) "N" size split spoons for surface soils at boreholes 19F01 and 19F02. After, standard (caliber "B") split-spoon samplers were used to collect representative soil samples and to determine the standard penetration test (SPT) index in accordance with the American Society for Testing and Materials (ASTM) D1586 Standard.

It should be noted that in the two (2) boreholes, a zone of boulders and pebbles was cored with an "NQ" core barrel.

Following drilling completion, a piezometer was installed in borehole 19F01 to allow subsequent groundwater level measurements.

Boreholes locations are shown on drawing presented in Appendix 1 and the borehole logs are presented in Appendix 2.

3.3 Environmental soil sample collection, transportation and storage

A total of twelve (12) soil samples, including two (2) blind-field duplicates, were collected from both boreholes. The collection and handling of soil samples were carried out according to the applicable guidelines of the MEFCC, including, but not necessarily limited to the *Environmental analyses sampling guide* (Booklet 1 "Generalities" and Booklet 5 "Sampling soils", including updating Section 5.3.3 of Booklet 5 ("Sample for Volatile Organic Compounds [VOC] Analysis"); and) published by the *Centre d'expertise en analyse environnementale du Québec* (CEAEQ).

Before each soil sample was taken, all instruments were subjected to the washing procedures described in the aforementioned guide.

Punctual samples for COV analysis were taken using a Terra Core® Sampler. Samples taken onsite were transferred to a 40 ml methanol glass vial supplied by the laboratory. A minimum of two (2) vials have been filled for each sample taken.

Punctual samples were also collected for all other analytical parameters. Samples, which were placed in 250 ml glass containers, were maintained at a temperature less than or equal to 6° C until they were taken over by the analytical laboratory.

VOC measurements were taken on all soil samples using a RAE Systems portable detector, MiniRAE Lite model.

Samples depth intervals and VOC measurements are all noted on borehole logs in Appendix 2.

3.4 Laboratory work

3.4.1 Geotechnical analyses

Samples collected during fieldwork were transported to our laboratory for analysis, identification and classification. They were all subjected to a careful visual examination by a geotechnical engineer.

A total of four (4) sieve analyses and three (3) determinations of natural water content were carried out on representative samples. The laboratory results are presented in Appendix 3.

All samples collected during the fieldwork that were not used for laboratory testing will be stored for a period of three (3) months from the date of the issuance of the final report. After this time period, the samples will be discarded unless otherwise requested.

3.4.2 Chemical analyses

As part of this mandate, five (5) soil samples, including one (1) blind field duplicate, were subjected to chemical analyses in the laboratory.

Chemical analyses were performed by Eurofins EnvironeX (Eurofins), a laboratory located in Longueuil (Québec). This laboratory is accredited ISO 17025 and has the required accreditation of the CEAEQ for the parameters analyzed as part of this mandate.

Soil samples were analyzed for the following parameters: petroleum hydrocarbons C_{10} to C_{50} (PH C_{10}-C_{50}), polycyclic aromatic hydrocarbons (PAH), VOC (monocyclic aromatic hydrocarbons [MAH] + chlorinated aliphatic hydrocarbons [CAH]) and/or metals (14 elements).

Soil samples, including duplicates, were selected for laboratory chemical analyses based on field observations and VOC measurements.

3.4.2.1 Criteria for interpretation of analytical results

As the construction includes the installation of a storm sewer pipe as well as the renovation of a commercial parking lot, analytical results were compared to "C" criteria of the MEFCC's Guide for all parameters analyzed. With the environmental management of excavated soils in perspective, analytical results were also compared to the "A" and "B" criteria of the MEFCC's Guide and limits identified in Schedule I of the RBCS.

For information purposes, the interpretation of the generic criteria of the MEFCC's Guide is presented in Appendix 4.

3.4.2.2 Quality control program

A quality control program was applied to verify the analytical results obtained. This program includes the analysis of control samples collected in the field by ABS staff and the verification of the results of the internal quality control of the Eurofins laboratory.

The onsite quality control consists of sampling and analyzing duplicate samples. Those duplicates are sampled simultaneously with the original sample and subjected to analyses at a minimum ratio of 10%. Thus, soil sample 19F02-CF-2-DUP (field duplicate of 19F02-CF-2) was subjected to laboratory chemical analyses for PH C_{10}-C_{50}, PAH and metals (14 elements).

As for the laboratory, it proceeded in an intern quality control program by analyzing laboratory blanks, certified reference standards and internal duplicates.

4.0 STRATIGRAPHY AND SOIL PROPERTIES

The stratigraphy of the sampled soils at the location of the completed boreholes is summarized in Table 1 and detailed in the borehole logs in Appendix 2.

Table 1: Soil stratigraphy of boreholes

Borehole	Surface elevation (m)	Top layer	Granular fill			Native soils						End of the borehole	
						Glacial till deposit			Layer of boulders and pebbles				
		Thickness (mm)	Depth	Ele.	Thick.	Depth	Ele.	Thick.	Depth	Ele.	Thick.	Depth	Ele.
Borehole on Saint-Laurent Boulevard													
19F01	25.57	-	0.00	25.57	1.83	1.83	23.74	0.18	2.01	23.56	>2.26	4.27	21.30
Borehole at the rear of 10345 Saint-Laurent Boulevard													
19F02	25.43	0.08	0.08	25.35	1.75	1.83	23.60	0.10	1.93	23.50	>2.03	3.96	21.47

Ele.: Elevation; **Thick**.: Thickness

4.1 Top layer

Directly on the surface of borehole 19F02, a layer of 80 mm thick wood chips used for landscaping, was intercepted. The presence of a geotextile membrane was encountered at the base of this layer.

It should be noted that no landscaping was present on the surface of borehole 19F01.

4.2 Granular fill

A layer of granular fill was intercepted in all boreholes.

At borehole 19F01, the granular fill consisted, at the surface, of brown and wet gravel and sand with some silt. The presence of traces (1-10%) of crushed stone was noted to a depth of 0.20 m. More deeply, the fill was rather composed of silt and sand to sandy and gravelly silt to some gravel, brown and wet to a depth of 1.83 m. Residual materials (ashes and gypsum) were identified in trace amounts to a depth of 1.83 m. It should be noted that the presence of an odour of petroleum hydrocarbons was detected at a depth of 0.84 m, and this, until the end of the granular fill.

At borehole 19F01, directly below the landscaping surface (wood chips and geotextile), at a depth of 0.08 m, a granular fill was sampled to a depth of 1.83 m. Up to a depth of 0.61 m, the fill consisted of brown, wet sand with some silt and traces of gravel. The presence of traces of organic materials was noted (1-5%). At a depth of 0.61 m, the fill was composed of brown, wet sand with some gravel. The presence of traces of roots was also observed (1-5%) during sampling.

Three (3) representative samples from the granular fill were sieved for particle size analysis. The table below presents the results obtained, which are detailed in Appendix 3.

Table 2: Results of sieve analyses – Granular fill

BOREHOLE	SAMPLE	DEPTH (m)	NATURAL WATER CONTENT (%)	GRAVEL (5 - 80 mm) (%)	SAND (80 μm - 5 mm) (%)	FINES (<80 μm) (%)
19F01	CF-2B	0.84 – 1.22	-	25.0	28.1	46.9
19F01	CF-3	1.22 – 1.83	12.1	25.7	25.7	52.3
19F02	CF-2	0.61 – 1.22	16.3	10.0	31.3	58.7

4.3 Native soils – Glacial till deposit

Directly below the granular fill in boreholes 19F01 and 19F02, a glacial till deposit was intercepted at a depth of 1.83 m. This native soil is composed of grey, wet gravelly and sandy silt. It should be noted that the presence of an odour of petroleum hydrocarbons was noticed at borehole 19F01 during sampling of the glacial till deposit, and this, to a depth of 2.01 m.

Sampling within the glacial till deposit at boreholes 19F01 and 19F02 ended on a split spoon refusal at a depth of 2.01 m and 1.93 m respectively over an area of boulders and pebbles.

One (1) representative sample from the glacial till deposit was sieved for particle size analysis. The table below presents the results obtained, which are detailed in Appendix 3.

Table 3: Results of sieve analysis – Glacial till deposit

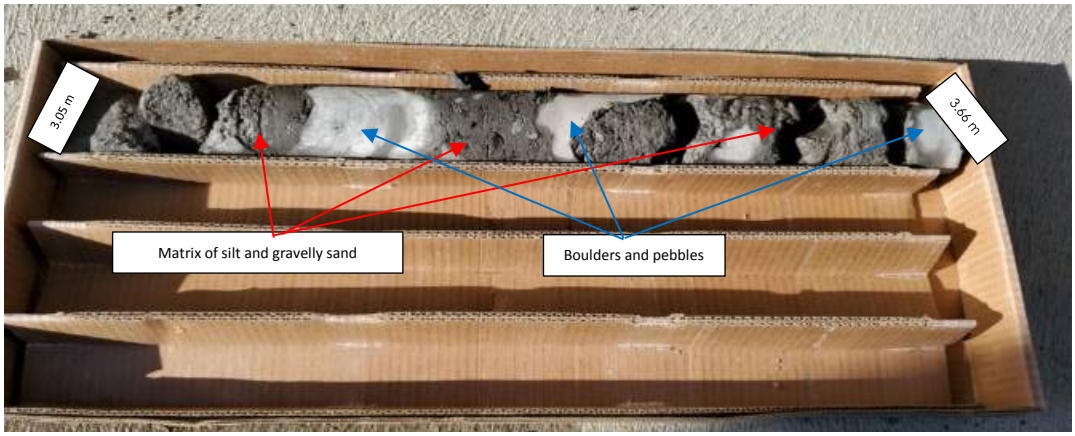
BOREHOLE	SAMPLE DEPTH (m)	NATURAL WATER CONTENT (%)	GRAVEL (5 - 80 mm) (%)	SAND (80 μm - 5 mm) (%)	FINES (<80 μm) (%)
19F01	CF-4 (2.13-2.01)	10.2	34.0	20.4	45.6

4.4 Layer of boulders and pebbles

Beneath the glacial till deposit, at boreholes 19F01 and 19F02, a layer of boulders and pebbles was intercepted until the end of drilling, at a depth of 4.27 m and 3.96 m respectively. Based on split-spoon refusals, sampling within the boulder and pebble layer was carried out with an "NQ" core barrel.

This layer is mainly composed of boulders and pebbles in a grey, very wet gravelly silt and sand matrix. It should be noted that the presence of an odour of petroleum hydrocarbons was noticed during sampling borehole 19F01 from 2.01 m to 2.36 m depth.

The photograph below shows the condition of sample CD-8 (3.05 - 3.66 m) from borehole 19F01 while coring the boulder and pebble layer.



Photograph 2: Sample of the boulder and pebble layer at borehole 19F01 (CD-8 | 3.05 m – 3.66 m) – November 29th, 2019

5.0 GROUNDWATER CONDITIONS

A piezometer was installed prior to casing removal in borehole 19F01 to allow subsequent measurements of the groundwater level.

The groundwater level was measured on December 5th, 2019 and the table below presents the results.

Table 4: Groundwater Level - December 5th, 2019

BOREHOLE	SURFACE ELEVATION (m)	WATER TABLE DEPTH (m)	WATER TABLE ELEVATION (m)
19F01	25.57	2.63	22.94

Please note that this information must be interpreted with caution since these conditions hold true only for the very short-term at the locations and the day mentioned in this report.

Groundwater conditions depend on different factors, such as seasonal/yearly fluctuations, precipitations and modifications made to the physical environment. Therefore, water inflow could be encountered at different levels during the future construction phase.

6.0 ORGANOLEPTIC EVIDENCES OF CONTAMINATION, VOC MEASUREMENTS AND RESIDUAL MATERIALS

At borehole 19F01, the presence of less than 10% of residual material (plaster and/or ashes) was observed from 0.20 m to 1.83 m deep. No residual material was observed at borehole 19F02.

Perceptible odours of petroleum hydrocarbons were noted in borehole 19F01 from a depth of 0.84 m to 2.36 m.

VOC measurements, taken from the samples collected, showed levels ranging from 0.4 to 87.9 parts per million (ppm).

The description of the residual materials and the organoleptic evidences of contamination are presented in the borehole logs in Appendix 2.

7.0 RESULTS OF CHEMICAL ANALYSES

7.1 Analytical results and observations

Results of chemical analyses performed on the selected soil samples collected as part of this study are presented in Table A and the certificates provided by Eurofins in Appendix 4. Also, Drawing EG-01, inserted in Appendix 1, presents a summary of analytical results using a colour code.

All the results obtained are below criterion "C" of the Guide for the parameters analyzed. Therefore, they are compliant for the site use. It should be noted that sample 19F02-CF-4 showed PAH concentrations in the "B-C" range of the Guide while sample 19F02-CF-2 showed PAH concentrations in the "A-B" range of the Guide.

All other results showed concentrations below criterion "A" of the Guide for all parameters.

7.2 Validity of analytical results

Field duplicate results are included in table A in Appendix 4. Based on the CEAEQ, the acceptability criterion of the relative deviation[1] between a field duplicate sample and its parent sample, which are relatively homogeneous soils or groundwater, is usually less or equal to 30% when analytical results are higher than 10 times the laboratory detection limit.

Manganese results showed concentrations greater than 10 times the detection limit for the original sample 19F02-CF-2 and its duplicate. The relative deviation calculated for this parameter is 40.42%, slightly higher than the CEAEQ's acceptability criterion of 30%. This deviation is likely due to the heterogeneity of the borehole fill. Furthermore, this difference does not affect the interpretation of the environmental quality of the soils. Thus, the results are considered representative.

The detection limits reached by Eurofins for all analyzed parameters for the soil results are lower or equal to the most restrictive criteria used for comparison for the current mandate.

Finally, the internal quality control data presented by Eurofins confirm the mastering of analysis procedures by the laboratory. The analytical results of the laboratory duplicate samples, for their part, show that the laboratory manipulated and prepared the samples they received in a good manner.

Eurofins internal quality control data are presented in the certificates of analysis in Appendix 4.

8.0 ESTIMATION OF SOIL AREAS

The polygon method (Thiessen polygons) is the method generally used to assess the onsite soil areas. The calculation of the soil areas is based on the analytical results of soil samples taken from the boreholes by taking as the area of influence of a borehole the mid-distance between the boreholes and the limits of the projected work.

In this mandate, as the scope of the projected work is not known, no polygon was estimated.

[1] *Relative deviation (%) =* $\frac{[(\text{concentration})_{\text{original sample}} - (\text{concentration})_{\text{sample duplicate}}]}{[((\text{concentration})_{\text{original sample}} + (\text{concentration})_{\text{sample duplicate}})/2]} \times 100$

9.0 MANAGEMENT OF CONSTRUCTION MATERIALS AND SOILS

The following sections present recommendations for the different methods of managing construction materials and soils. It should be noted that the potential reuse of existing materials presented in this section is based only on their environmental classification.

9.1 Management of construction materials

On January 9th, 2019, MEFCC issued a note on the environmental quality assessment of existing granular materials and the environmental management of excavated granular materials. This note provides some definitions and methodologies for characterizing granular materials. Regarding management, three (3) options are set out:

- If granular materials and soils are mixed in a pile or backfill, reference should be made to the notion of 50% or more soils after segregation for management;
- In the case of separate horizons of materials related to infrastructure, except for hazardous materials, it will not be necessary to conduct a characterization if the granular materials are disposed of in a technical landfill or a construction or demolition debris landfill. In all other situations, characterization is necessary when contamination is suspected or depending on the intended use;
- For the upgrading of granular materials and other types of concrete (curbstone) and asphalt mix materials, it is recommended to use the guidelines *Lignes directrices relatives à la gestion de béton, de brique et d'asphalte issus des travaux de construction et de démolition et des résidus du secteur de la pierre de taille* of the MEFCC.

9.2 Management of soils

The soils in place, whose contaminant concentrations are below criterion "C" of the Guide, are of acceptable environmental quality for the current use of the site. Depending on the needs of the project, these soils may be used on site as backfill material if they are geotechnically acceptable according to their intended uses.

In addition, upgrading in the field of origin is carried out to meet a specific need (useful and necessary infrastructure) that would otherwise require the supply of clean materials. This upgrading must be carried out in a controlled manner to prevent it from becoming a simple wild disposal of contaminants in the environment. However, if soils with organoleptic signs of contamination, not detected during drilling, are encountered at the excavation site, these soils must be stacked for chemical analysis.

It should be noted that the *Regulation respecting the application of Section 32 of the Environment Quality Act* requires that soils used under and around drinking water pipes be clean, i.e. have a level of contamination equal to or less than criterion "A" of the Guide. Covering with clean materials must continue at least 300 mm above any drinking water pipe.

The following sections present some management options if some excavated materials could not be reused as backfill materials at the study site. All the options for managing excavation cuttings are listed in the *Excavated Soil Management Grid* in the MEFCC Guide in Appendix 4.

9.2.1 Soils less than or equal to criterion "A"

The use of excavated materials less than or equal to criterion "A" of the Guide is unrestricted on any site.

9.2.2 Soils in the "A-B" range

Excavated materials with analytical results in the "A-B" range of the Guide could be managed as follows:

- Reused on lands other than the original land under the conditions of the *Regulation respecting contaminated soil storage and contaminated soil transfer stations* (RCSSCSTS) and if they do not emit petroleum hydrocarbon odours. This upgrading must be carried out in a controlled manner to prevent it from becoming a simple wild disposal of contaminants in the environment;
- Valued as a covering material in a technical landfill site (TLS), contaminated soil landfill site (CSLS), hazardous materials disposal site, pulp and paper mill waste disposal site or disposal site requiring covering. Certain conditions may apply to the options for using these soils;
- Disposed of in a landfill subject to the RBCS or in a TLS.

9.2.3 Soils in the "B-C" range

Soils, with analytical results in the "B-C" range of the Guide, could be recovered as cover materials in a landfill under certain applicable conditions, treated at the study site or at a MEFCC authorized treatment site, or disposed of in a landfill site covered by the RBCS.

10.0 ENVIRONMENTAL RECOMMENDATIONS

Based on the results obtained from this summary environmental soil characterization, the soils submitted for chemical analyses are compliant for the use of the site. However, since the environmental history of the site is unknown, there is still environmental uncertainty regarding the extent of contamination in the "B-C" range of soils in the 19F01 area. In this borehole, odours of petroleum hydrocarbons were noted by the technician during sampling and these odours were also detected by the VOC measurements taken.

Depending on the scope of the work planned in this sector and the needs of the future project, additional environmental characterization could be considered by the client in order to reduce the level of uncertainty regarding the extent of contaminated soils in the "B-C" range. Otherwise, it is recommended that the excavated materials generated during future work be managed according to the MELCC *Excavated Soil Management Grid* and the regulatory requirements in effect (see Section 9.0), with particular attention being paid to the 19F01 drilling sector.

Finally, in the event of the previously unidentified presence of soils with evidence of contamination or residual materials during excavation work, these must be separated from unaffected soils and characterized for management purposes.

11.0 GEOTECHNICAL RECOMMENDATIONS

11.1 Generalities

This study is part of a project of directional drilling to install a pipe connected to a storm sewer. It should be noted that the study site is located on Saint-Laurent Boulevard next to Mongeau Street in Montréal and extends to the rear parking lot of the building located at 10345 Saint-Laurent Boulevard.

It should be noted that no information was provided as to the depth of the new pipe and the method of installation of the pipe. However, depending on the requested depth of boreholes, the pipe would be placed at a depth of approximately 3.00 m.

Based on the geotechnical data obtained at the location of the boreholes and according to the information provided by the client, geotechnical recommendations are presented in the following sections.

11.2 Installation of the pipe

The intercepted stratigraphy and the points listed on the following pages must be taken into consideration when choosing the method of pipe installation. The choice of drilling method is the responsibility of the specialized firm that will carry out the work. The final choice of the method to be used by the contractor to carry out the crossing must be validated once the information on the entire route has been obtained. The contractor's work method must ensure the safety of existing structures and comply with all standards applicable to these structures.

If horizontal drilling is used, entry and receiving pits could be required. The excavation of these pits will have to consider the available space and adjacent structures (road, bridge, pipes, etc.). When planning the excavation work, it will be necessary to consider the fact that excavation in the glacial till deposit containing boulders and pebbles will be difficult.

It should be noted that fill was intercepted to a depth of 1.83 m in boreholes 19F01 and 19F02. The fill material observed does not constitute an adequate subgrade soil. Therefore, the foundation of the projected pipe must be placed within the native soils.

11.3 Protection against the effects of frost in soils

According to Environment Canada's database, the average frost index is given for several cities in Canada. The frost index for the project area is 909 °C-day (Montréal - Botanical Garden weather station). The anticipated depth of frost penetration into soils is therefore estimated at 1.70 m in this area. Consequently, the top of the pipe exposed to the action of frost must be covered with soils to a minimum thickness of 1.70 m to protect it from the harmful effects of frost.

11.4 Excavation and temporary retaining system

Depending on the stratigraphy encountered in boreholes on the study site, the projected excavation will be carried out in the fill, in the glacial till deposit and possibly in the boulder and pebble layer.

If there is enough space and if drainage conditions are respected, excavation can be done in open cuts. As these are temporary slopes, the contractor is responsible for their stability and the safety of the workers, the structure to be built and the surrounding structures when this safety depends on the stability of the temporary slopes.

However, unsupported slopes of about 2.0H:1.0V may be used in fill and native soil deposit.

The excavation must be carried out in accordance with the requirements of the *Safety Code for the construction industry*. If an unsupported excavation remains open for extended periods of time, it is recommended that daily inspections be carried out by geotechnical personnel to identify the potential for landslides and to determine the measures to be taken to correct any deficiencies.

It is recommended not to park heavy vehicles on the top of the excavation at a distance less than the depth of the excavation. It is also recommended not to drive vehicles on the top of the excavation within a distance less than the depth of the excavation to minimize vibrations.

It will also be important to ensure that a distance at least equal to the depth of excavation is maintained between the top of the slope and the base of the material piled onsite. This condition must always be respected unless special studies are carried out for each specific case.

If the excavation slopes cannot be made in open cuts, a temporary retaining system will be required during construction. The parameters listed in the table below can be used for the design of the temporary retaining system.

Table 5: Soil parameters for the design of a temporary retaining system

TYPE OF SOILS	PARAMETERS						
	φ' (°)	C_U (kPa)	γ (kN/m³)	γ' (kN/m³)	K_O	K_A	K_P
Granular fill	29	-	17	7	0.52	0.35	2.88
Glacial till deposit and boulders	34	-	19	9	0.44	0.28	3.54

Note: φ': friction angle; c' ou c_u: cohesion; γ: total unit weight; γ': effective unit weight; K_o: at rest lateral earth pressure coefficient; K_a: active lateral earth pressure coefficient; K_p: passive lateral earth pressure coefficient (for leveled backslope)

It is important to note that the hydrostatic pressure generated by the groundwater must be considered in the calculations of the stresses acting on the retaining system unless a permeable retaining system is used, or drainage is provided at the rear of the retaining system.

Where a void remains between the soil wall and the retaining system, it should be filled with granular material.

It is important to consider that the use of trench boxes is not an effective soil retaining system. They should be considered only as a system for worker protection. To ensure the slope stability, the contractor must excavate the walls at slopes that allow them to remain stable throughout the construction period.

Special care must be taken when excavating in the vicinity of existing structures in order to avoid any movement of the latter during the work.

11.5 Temporary drainage

On December 5th, 2019, the depth of the groundwater table was measured at 2.63 m from the surface (elevation 22.94 m).

For the excavation depth envisaged (approximately 3.00 m deep) and given the depth of the water table, significant water infiltration is expected during the work. It will be necessary to provide an adequate and efficient pumping system throughout the work. It is therefore recommended that the groundwater level be lowered to at least 0.30 m below the level of the excavation bottom throughout the work period.

In addition, the design of the pumping system should include all necessary measures (geotextile membrane, sand filter, etc.) to prevent the entrainment of fines (silt and clay) by the pumping process.

Groundwater lowering, caused by this intervention (pumping), must be carried out in such a way as to avoid damage to the surrounding infrastructure or buildings, if applicable.

11.6 Monitoring methods

Monitoring of surface movement during the work can be accomplished using subsurface settlement points and ground surface levelling points.

Subsurface settlement points measure the void created just above the pipe to predict potential settlement under the boulevard. They essentially consist of a small diameter measuring pipe anchored to the bottom of a vertical borehole and an outer casing to isolate the pipe from downward movement forces from the ground above the anchoring point. Settlements will be determined by measuring the elevation of the top of the measuring pipe by surveying.

Levelling points directly on the ground surface will be used to control the crossing differential elevation. ground surface points will be monitored simultaneously with the subsurface settlement points, which will serve as an indicator to any potential movements during the work.

Settlements at the ground surface and subsurface points can be determined by surveying. Subsurface settlement points will be referenced to surface benchmarks.

Once the installation has been completed, all points should be monitored according to the following instructions:

- Monitoring should begin prior to the excavation of access pits for the machinery and installation of the pipe. It shall be conducted at least twice (2) per day from the beginning of the work until at least three (3) days after the end of the work. This is required to demonstrate the accuracy of the surveys;
- In the event of a loss of soil around the pipe, a geotechnical engineer must be contacted immediately to give permission to continue or request that work be stopped for safety reasons.

In addition, measures should be taken with enough frequency to capture any unexpected movement as soon as possible, allowing the situation to be assessed within a reasonable period of time.

12.0 LIMIT OF THE STUDY

The soil characteristics described in this report were determined by the boreholes that were drilled on the aforementioned dates and are exact only at the location of the boreholes. Therefore, soil characteristics can be highly variable (as compared to those noted in the boreholes) between borehole locations.

In addition, it should be noted that soil and rock formations can vary on a site and that the boundaries between the different soils/rock presented in this report should not be considered fixed. Groupe ABS inc. does not guarantee the accuracy of these limits that depend on factors such as the number of boreholes or sampling method.

Furthermore, properties of soil and rock can be altered significantly as a result of construction activities at the site or on adjacent sites. They can also indirectly change due to the exposure of the soil or rock to frost/weather.

Groundwater conditions mentioned in this report apply only to the site under investigation. Groundwater levels indicated in this report hold true only for the very short-term at the place and the day mentioned in this report. The groundwater conditions depend on different factors, such as seasonal/yearly fluctuations, precipitations and modifications made to the physical environment. Therefore, water inflow could be encountered at different levels during future construction.

In this report, the descriptions of the samples were made according to methods of identification and classification commonly recognized and used in geotechnical engineering. These methods are subjected to judgment and interpretation. In practice, these descriptions can be assumed to be fair and correct.

The test results are valid for the samples described in this report. The interpretation of the site and laboratory results and accompanying recommendations apply only to the study site and the information available on the project at the time of writing this report. It does not apply to any other project or site.

The recommendations presented in this report are generally addressed to the project design team. The number of boreholes necessary to determine all subsurface conditions should be greater than the number of boreholes needed by the design team. If the project design is changed, Groupe ABS inc. should be consulted to ensure that the recommendations presented in this report are still valid. If necessary, additional field or laboratory work may be needed.

It is recommended that as site works progress, site inspections be done by Groupe ABS inc. in order to confirm and, if necessary, modify interpretations and recommendations given in this report. If such site visits are not possible, Groupe ABS inc. is not responsible for the geotechnical interpretation or recommendations that a third party may make of this report, particularly if the design is changed or if field conditions differ from those described in this report.

APPENDIX 1

BOREHOLE LOCATION PLAN AND SUMMARY OF ANALYTICAL RESULTS (1 PAGE)

Source : ©Grafic matrix in Autocad format provided by the City of Montreal.

Legend

Borehole performed by Groupe ABS inc.

CONTAMINATION LEVEL
(Refer to the colors of the symbols in the table in the section "Results of chemical analyses")

Boundaries of the study area

Geodesic coordinates (SCOPQ NAD83)			
Borehole	East (m)	North (m)	Elevation (m)
19F01	291893.5	5045475.3	25.57
19F02	291880.2	5045446.6	25.43

ANALYTICAL RESULTS

Color coding used for the symbols in this plan refer to the level of contamination based on the generic criteria of the MEFCC's *Guide - Soil Protection and Contaminated Sites Rehabilitation*.

For details respecting the analytical results, the reader should refer to the tables presented in the report or appendices.

Color code
Less than the A criteria
A-B range
B-C range
Greater than the C criteria
Greater than Schedule I of RBCS

Issue date of plan: february 2020

Source : ©2019 Google

ABS
17, Industrie Street
in Saint-Remi, Québec, J0L 2L0
Phone: 450 454-5644 | Email: st-remi@groupeabs.com
Fax: 450 454-5645

Drawn by: F. Milord, Drafter
Reviewed by: C. Daigneault, Eng.
Reviewed by: E. Amegandjin, Eng., M. Sc.

Client: BHP Experts Conseils S.E.C.

Title: Borehole location plan

Project: Geotechnical investigation and summary environmental soil characterization

Location: 10345, Saint-Laurent Boulevard in Montréal, Québec

Scale: 1:400 | Client code: BHP101
F/N: UD-19-2742-00 | Drawing # EG-01 | 1/1
Client ref.:

0 4m 8m 12m 16m 20m

Note: All indications in this drawing are located approximately, according to satellite images and/or chaining. The graphical registers are, for their part, georeferenced with the lot limits. It should be noted that only the surveys recorded by the surveyor are georeferenced. This information will be indicated in the legend.
This drawing should be read in accordance with the report that accompanies it.

APPENDIX 2

BOREHOLE LOGS (2 PAGES)
TERMS AND SYMBOLS USED ON BOREHOLE LOGS (1 PAGE)

BOREHOLE REPORT

Borehole N° 19F01

Project Name:	**Geotechnical investigation and summary environmental soil characterization**
Client:	**BHP Experts Conseils S.E.C.**
Location:	**10345, Saint-Laurent Boulevard in Montréal, Québec**
Contractor:	**M3 Drilling**
Type of Borehole:	**Casing and Hollow stem auger**
Borehole Diameter:	**203 mm**
Core Diameter:	**NQ**
Field Technician:	**R. Guerib, Tech.**
Prepared by:	**F. Milord, drafter**

Client: **BHP101** F/N: **UD-19-2742-00**

Geodesic Coordinates (NAD83 SCOPQ SCRS) Zone: 8
X : **291893.5**
Y : **5045475.3**
Z : **25.57**

Plan Number: **EG-01**
Date of Borehole: **2019-11-28**
Depth of Borehole (m) : **4.27**

SAMPLE STATE
- Disturbed
- Intact (thin wall sampler)
- Lost
- Diamond core

TERMINOLOGY

"traces"	1-10 %
"some"	10-20 %
adjective (sandy...)	20-35 %
"and"	35-50 %

CLASSIFICATION

Clay	< 0,002 mm
Silt	0.002 to 0.08 mm
Sand	0.08 to 5 mm
Gravel	5 to 80 mm
Cobbles	80 to 300 mm
Blocks	> 300 mm

COMPACTION INDEX "N"

Very Loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

CONSISTENCY "Cu" (kPa)

Very Soft	< 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	> 200

ROCK QUALITY DESIGNATION

QUALIFIER	% RQD
Very Poor	<25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

VISUAL CONTAMINATION (hydrocarbons)
A : Absent
D : Disseminated
P : Pervasive

DEGREE OF PLASTICITY

	"W_L"	$S_t = Cu/Cu_r$
Low	< 30 %	< 2
Medium	30 - 50 %	2 - 4
High	> 50 %	4 - 8
Very high		8 - 16
Sensitive		> 16

CALIBER
P : 148 mm
N : 64 mm
B : 51 mm

WATER LEVEL
Date: 2019-12-05
Depth(m) 2.63 m
Water Infiltration
Groundwater table

DEPTH (m)	DEPTH - ft	ELEVATION (m)	STRATIGRAPHIC DESCRIPTION	SYMBOL	TYPE NO	SUB-SAMPLE	CALIBER	STATE	RECOVERY	N, R or RQD	BLOW COUNTS /15 cm Fragmentation (mm)	VOC (ppm)	VISUAL CONTAMINATION (hydrocarbons) A	D	P	GRAPHIC	WATER LEVELS	LAB TESTS
		25.57	Level															
		0.00	Granular fill: brown gravel and sand, some silt, wet. Presence of crushed stone (1-10%)			A						0.9						
		25.37			CF-1	B	N		71		18-37-28-20	0.9						
		0.20	Brown silt and sand, some gravel, wet. Presence of residual materials: ashes and gypsum, 5-10%.			A						0.3						AC
		24.73			CF-2	B	N		100		15-28-32-24	0.3						AG
1		0.84	Brown sandy and gravelly silt, traces of clay, wet. Presence of an odor of petroleum hydrocarbons and residual materials: ashes, 1-2%.															
	5				CF-3		B		75	60	15-20-40-48	14.8						AG Wn = 12.1%
		23.74																
		1.83	Native glacial till deposit: grey gravelly and sandy silt, traces of clay, wet, very dense. Presence of an odor of petroleum hydrocarbons.		CF-4		N		100	R	100-50 / 3 cm	87.9						AC AG Wn = 10.2%
2		23.56			CD-5		NQ		22									
		2.01			CF-6		B		100	R	100 / 5 cm							
		23.21																
		2.36	Layer of boulders and pebbles in a grey gravelly silt and sand matrix, saturated. Presence of an odor of petroleum hydrocarbons.		CD-7		NQ		50									
		23.14																
3	10	2.43	Native glacial till deposit: grey gravelly and sandy silt, traces of clay, wet, very dense. Presence of an odor of petroleum hydrocarbons.		CD-8		NQ		42									
			Layer of boulders and pebbles in a grey gravelly silt and sand matrix, saturated. Presence of an odor of petroleum hydrocarbons.		CD-9		NQ		100									
4		21.30																
		4.27	END OF THE BOREHOLE															
	15																	

GRAPHIC: ▲ : N (standard pen.) △ : Nc (dynamic pen.) ▼ : Cu (laboratory) ▽ : Cur (laboratory) × : Cu (field) + : Cur (field); W_p W_n W_l; 20 40 60 80

LAB TESTS
G : grain size analysis
CA : chemical analysis
LI : liquid limit
PI : plastic limit
w : water content
Qu : rock comp. strength
Cur : disturbed shear strength
Cu : undrained shear strength
Cc : consolidation coefficient
k : permeability
Dup : duplicata

Remark(s) :

Verified by: **C. Daigneault, Eng.**

Approved by: **E. Amegandjin, Eng., M.Sc.**

Date of report 2020-02-12

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BOREHOLE REPORT

Borehole N° 19F02

Project Name:	**Geotechnical investigation and summary environmental soil characterization**
Client:	**BHP Experts Conseils S.E.C.**
Location:	**10345, Saint-Laurent Boulevard in Montréal, Québec**
Contractor:	**M3 Drilling**
Type of Borehole:	**Casing and Hollow stem auger**
Borehole Diameter:	**203 mm**
Core Diameter:	**NQ**
Field Technician:	**B. Massé**
Prepared by:	**F. Milord, drafter**

Client: **BHP101** F/N: **UD-19-2742-00**

Geodesic Coordinates (NAD83 SCOPQ SCRS) Zone: 8
X : **291880.2**
Y : **5045446.6**
Z : **25.43**

Plan Number: **EG-01**
Date of Borehole: **2019-11-29**
Depth of Borehole (m) : **3.96**

SAMPLE STATE
- Disturbed
- Intact (thin wall sampler)
- Lost
- Diamond core

TERMINOLOGY

"traces"	1-10 %
"some"	10-20 %
adjective (sandy...)	20-35 %
"and"	35-50 %

CLASSIFICATION

Clay	< 0,002 mm
Silt	0.002 to 0.08 mm
Sand	0.08 to 5 mm
Gravel	5 to 80 mm
Cobbles	80 to 300 mm
Blocks	> 300 mm

COMPACTION INDEX "N"

Very Loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

CONSISTENCY "Cu" (kPa)

Very Soft	< 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	> 200

ROCK QUALITY DESIGNATION

QUALIFIER	% RQD
Very Poor	<25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

VISUAL CONTAMINATION (hydrocarbons)
A : Absent
D : Disseminated
P : Pervasive

DEGREE OF PLASTICITY "W_L" $S_t = Cu/Cu_r$

Low	< 30 %	< 2
Medium	30 - 50 %	2 - 4
High	> 50 %	4 - 8
Very high		8 - 16
Sensitive		> 16

CALIBER
P : 148 mm
N : 64 mm
B : 51 mm

WATER LEVEL
Date:
Depth(m) : m
Water Infiltration
Groundwater table

DEPTH (m)	DEPTH - ft	ELEVATION (m)	STRATIGRAPHIC DESCRIPTION	SYMBOL	TYPE NO	SUB-SAMPLE	CALIBER	STATE	RECOVERY	N, R or RQD	BLOW COUNTS /15 cm Fragmentation (mm)	VOC (ppm)	VISUAL CONTAMINATION (hydrocarbons) A	D	P	GRAPHIC	WATER LEVELS	LAB TESTS
		25.43	Level															
		0.00 / 25.35	Wood chips. Presence of a geotextile at 0.08 m.			A												
		0.08	Granular fill: brown sand, some silt, traces of gravel, wet.		CF-1	B	N		83		4-10-14-18	2.2						
		24.82 / 0.61	Presence of organic materials (1-5%).															
1			Brown sandy silt, some gravel, wet. Presence of roots (1-5%).		CF-2		N		67		11-21-24-38	30.4						AC+DUP AG Wn = 16.3%
	5				CF-3		B		81	R	35-106-50 / 10 cm	1.3						
		23.60																
2		1.83 / 23.50 / 1.93	Native glacial till deposit: grey gravelly and sandy silt, wet, very dense.		CF-4		B		100	R	50 / 10 cm	0.4						AC
					CD-5		NQ											
		22.99 / 2.44 / 22.91 / 2.52	Layer of boulders and pebbles in a grey gravelly silt and sand matrix, very wet. Grey sand and gravel, traces of silt, wet.		CF-6		B		100	R	50 / 8 cm							
3	10		Layer of boulders and pebbles in a grey gravelly silt and sand matrix, very wet.		CD-7		NQ											
					CD-8		NQ											
					CD-9		NQ											
4		21.47 / 3.96	END OF THE BOREHOLE															
	15																	

GRAPHIC: ▲ : N (standard pen.) △ : Nc (dynamic pen.) ▼ : Cu (laboratory) ▽ : Cur (laboratory) × : Cu (field) + : Cur (field); W_p W_n W_l; 20 40 60 80

LAB TESTS
G : grain size analysis
CA : chemical analysis
Ll : liquid limit
Pl : plastic limit
w : water content
Qu : rock comp. strength
Cur : disturbed shear strength
Cu : undrained shear strength
Cc : consolidation coefficient
k : permeability
Dup : duplicata

Remark(s) :

Verified by: **C. Daigneault, Eng.**
Approved by: **E. Amegandjin, Eng., M.Sc.**
Date of report 2020-02-12

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TEST PIT AND BORING LOG REPORT EXPLANATORY NOTE

Soil description

Each layer of subsoil is described following the terminology listed below. Granular soil compactness is defined by the standard penetration index value "N" and cohesive soil consistency is defined by the undisturbed shear strength (Cu).

Depth, elevation and scale

The depth of the various stratigraphic layers is based upon the ground surface of the corresponding test pit or borehole. All elevations can be arbitrary or geodesic, the reference level always being indicated. The elevation and depth scale is always indicated in meters.

Soil classification

Clay		< 0,002 mm
Silt		0,002 - 0,08 mm
Sand	fine	0,08 - 0,4 mm
	medium	0,4 - 1,0 mm
	coarse	1,0 - 5,0 mm
Gravel	fine	5,0 - 10,0 mm
	coarse	10,0 - 80,0 mm
Cobbles		80,0 - 300,0 mm
Boulders		> 300,0 mm

Terminology and proportions

" traces "	< 10%
" some "	10 - 20%
Adjective (sandy…)	20 - 35%
" and "	> 35%

Granular soils

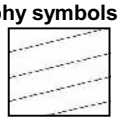
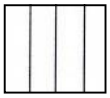
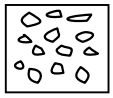
Compactness	**Standard penetration index " N " (blow counts / 300 mm)**
Very loose	< 4
Loose	4 -10
Compact	10 - 30
Dense	30 - 50
Very dense	> 50

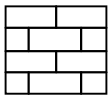
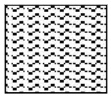
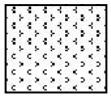
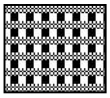
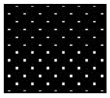
Cohesive soils

Consistency	**Shear strength " Cu " (kPa)**
Very soft	< 12
Soft	12 - 25
Firm	25 -50
Stiff	50 - 100
Very stiff	100 - 200
Hard	> 200

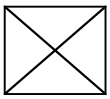
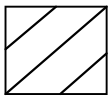
Plasticity index	**Liquid limit " W_L"**	**Sensitivity $S_t = Cu/Cu_R$**
Low	< 30%	< 2
Medium	30 - 50%	2 - 4
High	> 50%	4 - 8
		8 - 16
		> 16

Stratigraphy symbols

Clay 
Silt 
Sand 
Gravel 
Cobbles and Boulders 

Rock 
Organic soil 
Concrete 
Crushed stone 
Asphalt 

Soil state

Disturbed 
Intact 

Groundwater symbols

Water infiltration 
Groundwater table 

ABBREVIATIONS

Samples		Split spoon	CF
		Thin wall tube (Shelby)	TM
		Helical auger	TR
		Coring drill	CR
In situ and laboratory tests		Hydrometer test	S
		Grain size analysis	G
Plasticity index	IP	Water content	W
Liquid limit	W_L	Unit weight	γ
Plastic limit	W_P	Consolidation	C
Atterberg limit	A	Swedish fall cone	CS
		Hydraulic conductivity	K
		Refusal	R

APPENDIX 3

GEOTECHNICAL LABORATORY TEST RESULTS
TEST REPORTS (1 PAGE)

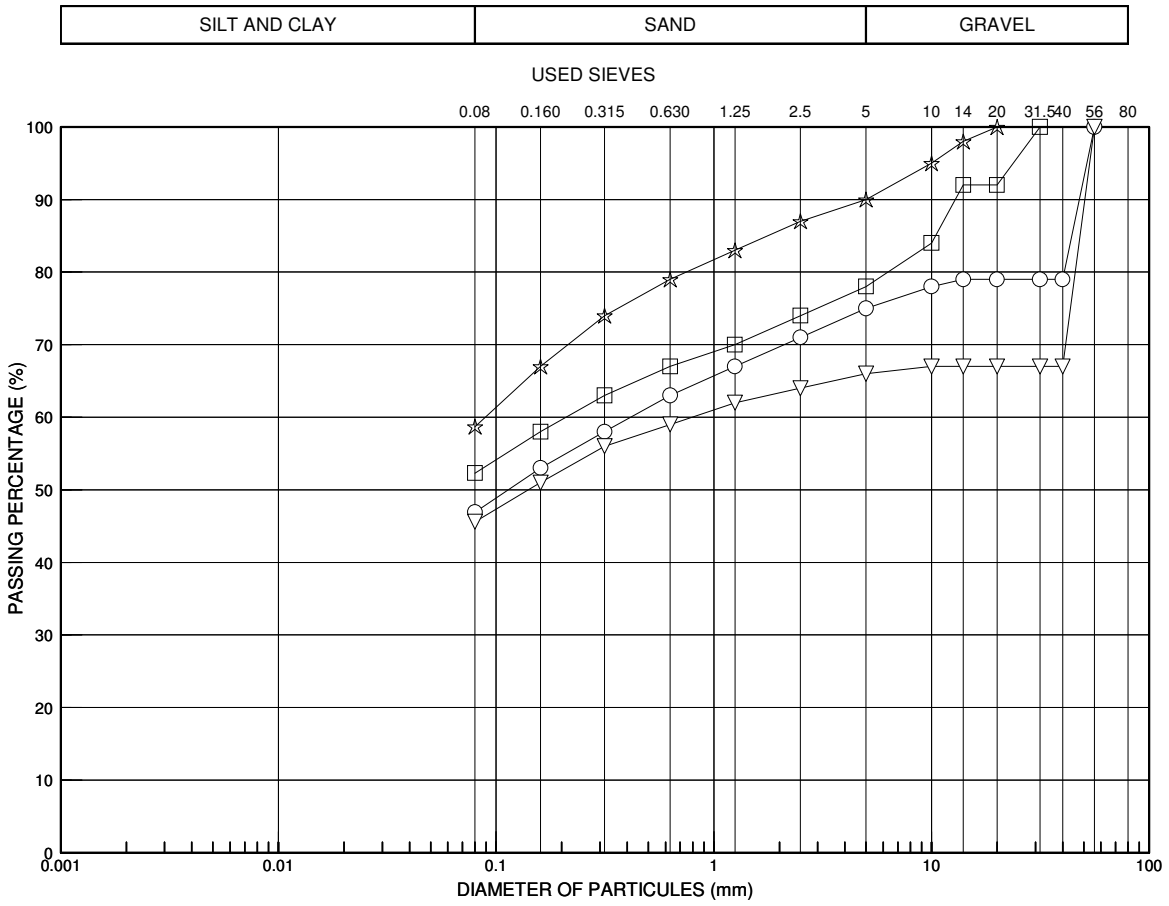
SIEVE ANALYSIS LAB REPORT

Client : BHP101

Project : UD-19-2742-00

Project name : Geotechnical investigation and summary environmental soil characterization

GRANULOMETRIC CURVE



SIEVE ANALYSIS RESULTS: % PASSING

LEGEND	0,08 mm	0.16 mm	0,315 mm	0,630 mm	1,25 mm	2,5 mm	5 mm	10mm	14mm	20mm	31,5mm	40mm	56mm	80mm	Cu	Cc
○	46.90	53.00	58.00	63.00	67.00	71.00	75.00	78.00	79.00	79.00	79.00	79.00	100.00	100.00		
□	52.30	58.00	63.00	67.00	70.00	74.00	78.00	84.00	92.00	92.00	100.00	100.00	100.00	100.00		
▽	45.60	51.00	56.00	59.00	62.00	64.00	66.00	67.00	67.00	67.00	67.00	67.00	100.00	100.00		
☆	58.70	67.00	74.00	79.00	83.00	87.00	90.00	95.00	98.00	100.00	100.00	100.00	100.00	100.00		

INTERPRETATION OF RESULTS AND WATER CONTENT

LEGEND	SURVEY	SAMPLE	DEPTH. (m)	DESCRIPTION	GRAVEL	SAND	SILT & CLAY	W	D10	D30	D60	USCS
○	19F01	CF-2B	0.84 - 1.22	Sandy and gravelly silt.	25 %	28.1 %	46.9 %				0.42	SM
□	19F01	CF-3	1.22 - 1.83	Sandy and gravelly silt.	22 %	25.7 %	52.3 %	12.1 %			0.21	
▽	19F01	CF-4	1.83 - 2.01	Sandy and gravelly silt.	34 %	20.4 %	45.6 %	10.2 %			0.79	GM
☆	19F02	CF-2	0.61 - 1.22	Sandy silt, some gravel	10 %	31.3 %	58.7 %	16.3 %			0.09	

Prepared by : V. Fauteux Date : 2019-12-04

Reviewed by : E. Amegandjin, Eng., M.Sc. Date : 2019-12-09

APPENDIX 4

GENERIC CRITERIA OF THE MEFCC'S GUIDE (5 PAGES)
TABLE OF ANALYTICAL RESULTS (1 PAGE)
CERTIFICATES OF CHEMICAL ANALYSES (13 PAGES)

Extract from the *Guide for Soils protection and contaminated sites rehabilitation*

Generic soil criteria (Appendix 2) are used to assess the contamination and to set decontamination objectives for a given use. They are also used to manage excavated contaminated soils. They have been established to ensure the protection of future users and the environment. The decontamination of a land in accordance with the generic criteria corresponding to the land's use constitutes an easy rehabilitation method to carry out and that demands the least follow-up and commitment for the future.

It should be noted that specific criteria for land that passes from industrial to agricultural use are not included in this criteria grid. It is recommended that such reuse is carried out on clean soils, that is to say that they comply with the A criteria of the grid for soils. If soils do not meet this criterion, a demonstration should be made that concentrations found on the land in the area where plants' root system extends are safe for the projected agricultural use.

A, B and C criteria may be defined as follows:

Criterion A: Background levels for inorganic parameters and quantification limit for organic parameters. The quantification limit is defined as the minimum concentration that can be quantified using an analysis method of defined reliability

Criterion B: (limit values of LPRR's Schedule I): Maximum acceptable limit for residential land or land where certain institutional uses (primary or secondary schools, early childhood centers, child care centers, hospitals, long-term care and residential centers, rehabilitation centers, centers for the protection of children and youth, detention facilities) and the first meter of playgrounds in municipal parks.

Criterion C: (limit values of LPRR's Schedule II): Maximum acceptable limit for industrial, commercial, non-sensitive institutional and recreational land (bike paths and municipal parks, except the first meter of playgrounds), as well as those intended to form the pavement/sidewalk on the edge of it.

Annexe 5 : Grille de gestion des sols excavés

La grille de gestion des sols excavés a été élaborée de manière à encourager la valorisation des sols contaminés, en respect de la réglementation en vigueur (section 6.5.1.2 du présent guide d'intervention). Il est attendu que la gestion des sols contaminés sur leur terrain d'origine ou non s'effectue en tout temps dans une optique de **valorisation**, c'est-à-dire pour satisfaire un besoin spécifique (infrastructures utiles et nécessaires) qui nécessiterait autrement l'apport de matériaux propres provenant de milieux naturels qui devraient alors être exploités pour combler la demande (carrières, sablières, tourbières, etc.). Le cas particulier des sols qui sont mélangés à des matières résiduelles est discuté à la section 7.7. du présent guide.

La grille de gestion des sols excavés ne s'applique que pour une contamination de nature anthropique. S'il est établi, en utilisant la procédure décrite dans les *Lignes directrices sur l'évaluation des teneurs de fond naturelles dans les sols* (voir l'encadré de la section 8.2.1.2), que la concentration naturelle d'une substance dans le sol est supérieure au critère A, cette concentration sera considérée comme équivalente au critère A.

≤ critère A[1]

Utilisés sans restriction sur tout terrain.

< critère B (valeurs limites de l'annexe I du RPRT)

1. Ailleurs que sur le terrain d'origine[2], les sols ne peuvent être déposés que sur des sols dont la concentration en contaminants est égale ou supérieure à celle des sols remblayés (article 4 du RSCTSC) et s'ils ne dégagent pas d'odeurs d'hydrocarbures perceptibles. Cette valorisation doit se faire de façon contrôlée, pour éviter qu'elle ne se transforme en une simple élimination sauvage de contaminants dans l'environnement.
2. Aux mêmes conditions, déposés sur ou dans des terrains destinés à l'habitation s'ils sont utilisés comme matériau de remblayage dans le cadre de travaux de réhabilitation de terrains faits conformément à la LQE.

≤ critère B (valeurs limites de l'annexe I du RPRT)

1. Valorisés sur le terrain d'origine[2] ou sur le terrain à partir duquel a eu lieu l'activité à l'origine de la contamination. Les sols ne doivent pas dégager d'odeurs d'hydrocarbures perceptibles. Cette valorisation doit se faire de façon contrôlée, pour éviter qu'elle ne se transforme en une simple élimination sauvage de contaminants dans l'environnement.
2. Valorisés comme matériau de recouvrement journalier ou final dans un lieu d'enfouissement technique (LET), comme matériau de recouvrement hebdomadaire ou final dans un lieu d'enfouissement en tranchée ou comme recouvrement mensuel ou final dans un lieu d'enfouissement de débris de construction ou de démolition, conformément au REIMR aux conditions des articles 42, 50, 90, 91, 105 ou 106.
3. Valorisés comme recouvrement final dans un lieu d'enfouissement de sols contaminés (LESC) aux conditions décrites à l'article 38 du RESC ou valorisés dans un système de captage des gaz prévu à l'article 13 du RESC.
4. Valorisés comme recouvrement final d'un lieu de dépôt définitif de matières dangereuses aux conditions de l'article 101 du RMD.
5. Valorisés comme matériau de recouvrement final dans un système de gestion qui comporte le dépôt définitif par enfouissement de déchets de fabriques de pâtes et papiers, aux conditions de l'article 116 du Règlement sur les fabriques de pâtes et papiers (RFPP).

6. Valorisés sur un lieu d'élimination nécessitant un recouvrement, aux conditions prévues dans l'autorisation délivrée en vertu de l'article 22 de la LQE.
7. Valorisés avec ou sans MRF comme matériau apte à la végétation dans des projets de restauration d'aires d'accumulation de résidus miniers[3] ou dans la couverture de lieux visés par le RFPP, le RESC ou le RMD. Les sols ne doivent pas dégager d'odeurs d'hydrocarbures perceptibles. Dans le cas d'ajout de MRF, le projet doit être autorisé et respecter le *Guide sur l'utilisation de matières résiduelles fertilisantes pour la restauration de la couverture végétale de lieux dégradés*[4].
8. Valorisés comme couche de protection d'une géomembrane utilisée dans un système multicouche lors de la restauration d'une aire d'accumulation de résidus miniers générateurs d'acide[3].
9. Éliminés dans un lieu d'enfouissement visé par le RESC.
10. Éliminés dans un LET, un lieu d'enfouissement en tranchée, un lieu d'enfouissement en milieu nordique, un lieu d'enfouissement de débris de construction ou de démolition ou un lieu d'enfouissement en territoire isolé, conformément à l'article 4 du REIMR.

≥ critère B et ≤ critère C

1. Valorisés sur le terrain d'origine[2] comme matériau de remblayage, à la condition que les concentrations mesurées respectent les critères ou valeurs limites réglementaires applicables aux sols selon l'usage et le zonage. Cette valorisation doit se faire de façon contrôlée, pour éviter qu'elle ne se transforme en une simple élimination sauvage de contaminants dans l'environnement.

1. Valorisés comme matériau de recouvrement dans un LET ou comme matériau de recouvrement hebdomadaire dans un lieu d'enfouissement en tranchée, aux conditions des articles 42, 50 ou 90 du REIMR. Ces conditions incluent notamment que les concentrations de composés organiques volatils soient égales ou inférieures aux critères B.
2. Traités sur place ou dans un lieu de traitement autorisé.
3. Éliminés dans un lieu d'enfouissement visé par le RESC.

< annexe I du RESC

1. Valorisés pour remplir des excavations sur le terrain d'origine[2] lors de travaux de réhabilitation, aux conditions prévues dans le plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), à la condition que les hydrocarbures pétroliers C_{10}-C_{50} et les COV respectent les critères d'usage.
2. Traités sur place ou dans un lieu de traitement autorisé.
3. Éliminés dans un lieu d'enfouissement visé par le RESC.

≥ annexe I du RESC

1. Décontaminés sur place ou dans un lieu de traitement autorisé et gestion selon le résultat obtenu. Si cela est impossible, éliminés dans un lieu d'enfouissement visé par le RESC pour les exceptions mentionnées à l'article 4, paragraphe 1°, sous-paragraphe *a), b)* ou *c)*.

Cas particuliers

1. Des sols contaminés peuvent être utilisés pour la construction d'un écran visuel ou antibruit aux conditions décrites dans le présent guide d'intervention (section 7.6.3) :

   c. Sur un terrain dont l'usage est résidentiel ou institutionnel sensible[5] avec des sols du terrain d'origine[2] :

      i. dont les concentrations sont ≤ B;

      ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols contiennent des concentrations ≤ B en hydrocarbures pétroliers C_{10}-C_{50} et en COV[6];

      iii. dont les concentrations sont < aux valeurs limites de l'annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (section 6.6), sous les mesures de confinement, à condition que les sols en place soient de niveau > C et que les sols déposés contiennent des concentrations ≤ B en hydrocarbures pétroliers C_{10}-C_{50} et en COV[6];

   d. Sur un terrain dont l'usage est commercial/industriel ou institutionnel/parc (sans usage sensible[5]) avec des sols du terrain d'origine[2] :

      i. dont les concentrations sont ≤ C;

      ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement;

      iii. dont les concentrations sont < aux valeurs limites de l'annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (section 6.6), sous les mesures de confinement, à condition que les sols en place soient > C et que les sols déposés contiennent des concentrations ≤ C en hydrocarbures pétroliers C_{10}-C_{50} et en COV[6].

2. La valorisation de sols contaminés dans un procédé en remplacement d'une matière vierge est possible aux conditions de l'autorisation.

3. Les sols ≥ B peuvent être acheminés sur les aires de résidus miniers s'ils sont contaminés exclusivement par des métaux ou métalloïdes résultant des activités minières de l'entreprise responsable de l'aire, aux conditions de l'autorisation délivrée par le Ministère (article 6 du RSCTSC).

4. Les sols ≥ B peuvent être acheminés dans un lieu de dépôt définitif de matières dangereuses aux conditions de l'autorisation détenue par ce lieu pour recevoir des sols.

Note : S'il y a présence de matières résiduelles dans les sols, se référer à la figure 12 de la section 7.7.2.

1. S'il est établi que la concentration naturelle dans un sol excavé est supérieure au critère A, il est recommandé que ce sol soit valorisé sur le terrain d'origine ou sur des terrains situés à proximité de façon à ce que les sols récepteurs, de par leur origine géologique et les teneurs naturelles qu'on est susceptible d'y trouver, soient apparentés aux sols déposés. Si la concentration naturelle dans ce sol est supérieure à la concentration du sol récepteur, il est attendu que le propriétaire du terrain récepteur conserve une trace du remblayage (localisation, niveau de contamination, provenance des sols importés). Advenant le cas où les concentrations naturelles excéderaient largement les critères

génériques recommandés pour l'usage qui est fait du terrain récepteur, un avis de la Direction de santé publique sur le risque pour la santé pourrait être demandé, ainsi qu'un avis sur le risque pour l'écosystème.

2. Le « terrain d'origine » fait référence au terrain d'où les sols ont été excavés. S'il s'agit d'une bande linéaire, pour la réfection d'une route par exemple, le terrain d'origine est la zone (du chantier) où se déroulent les travaux. Ainsi, si des sols provenant d'une zone de travaux sont stockés et qu'ils sont réutilisés ultérieurement sur une autre zone de travaux (un autre chantier) située sur le même axe routier, il ne s'agit plus du terrain d'origine.
3. Ne s'applique pas aux sols contaminés = B, à moins que ces sols n'aient d'abord transité par un lieu visé à l'article 6 du RSCTSC. Les sols excavés ≥ B ne peuvent en effet être acheminés directement que dans des lieux légalement autorisés à les recevoir et listés à l'article 6 du RSCTSC.
4. Il faudra toutefois s'assurer que la valorisation de sols A-B, auxquels on aura ajouté des matières fertilisantes ou non, entraîne un effet bénéfique, notamment sur la croissance de la végétation, et que ces sols répondent à un besoin réel, l'ajout de sols n'étant pas essentiel dans tous les cas de restauration minière. Il sera possible de s'assurer du bien-fondé du projet de valorisation et de son contrôle dans le cadre d'une autorisation délivrée préalablement à sa réalisation.
5. Dans ce contexte, un usage institutionnel sensible fait référence à un établissement d'enseignement primaire ou secondaire, un centre de la petite enfance, une garderie, un centre hospitalier, un centre d'hébergement et de soins de longue durée, un centre de réadaptation, un centre de protection de l'enfance et de la jeunesse ou un établissement de détention (voir les sections 5.2.1.2 et 5.2.2.2 du présent guide).
6. L'écran visuel ou antibruit doit être recouvert de 1 m de sols ≤ A ou de 40 cm de sols ≤ A aux endroits recouverts d'une structure permanente (asphalte ou béton). Il est possible d'utiliser dans la couche apte à la végétation du terreau « tout usage » provenant d'une installation autorisée ainsi que des MRF selon les orientations du *Guide sur l'utilisation des matières résiduelles fertilisantes pour la restauration de la couverture végétale des lieux dégradés*, toutefois la résultante doit être ≤ A.

Table A: Analytical results - Soils

Borehole name					19F01		19F02		
Sample name					19F01-CF-2A	19F01-CF-4	19F02-CF-2	19F02-CF-2 DUP	19F02-CF-4
Sampling date (year-month- day)					28-11-19	28-11-19	29-11-19	29-11-19	29-11-19
Sampling depth (m)					0.61 - 0.84	1.83 - 2.01	0.61 - 1.22	0.61 - 1.22	1.83 - 1.93
Interpreted contamination level of the sample					< A	B-C	A-B	A-B	< A
Parameters	Maximal limits (mg/kg) (ppm)								
	A[1]	B[2]	C[3]	RBCS[4]					
PAH - Polycyclic aromatic hydrocarbons									
Acenaphthene	0,1	10	100	100	< 0.10	< 0.20	< 0.10	0.11	< 0.10
Acenaphthylene	0,1	10	100	100	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	0,1	10	100	100	< 0.10	< 0.10	0.14	0.37	< 0.10
Benzo(a)anthracene	0,1	1	10	34	< 0.10	< 0.10	0.2	0.49	< 0.10
Benzo(a)pyrene	0,1	1	10	34	< 0.10	< 0.10	0.19	0.46	< 0.10
Benzo(b)fluoranthene	0,1	1	10	-	< 0.10	< 0.10	0.15	0.35	< 0.10
Benzo(j)fluoranthene	0,1	1	10	-	< 0.10	< 0.10	< 0.10	0.21	< 0.10
Benzo(k)fluoranthene	0,1	1	10	-	< 0.10	< 0.10	< 0.10	0.21	< 0.10
Benzo(b,j,k) fluoranthene	-	-	-	136	< 0.10	< 0.10	0.15	0.77	< 0.10
Benzo(c)phenanthrene	0,1	1	10	56	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(g,h,i)perylene	0,1	1	10	18	< 0.10	< 0.10	0.13	0.31	< 0.10
Chrysene	0,1	1	10	34	< 0.10	< 0.10	0.22	0.53	< 0.10
Dibenzo(a,h)anthracene	0,1	1	10	82	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo(a,i)pyrene	0,1	1	10	34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo(a,h)pyrene	0,1	1	10	34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo(a,l)pyrene	0,1	1	10	34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dimethyl-7,12 benzo(a)anthracene	0,1	1	10	34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	0,1	10	100	100	< 0.10	< 0.10	0.59	1.49	< 0.10
Fluorene	0,1	10	100	100	< 0.10	0.19	< 0.10	0.21	< 0.10
Indeno(1,2,3-cd)pyrene	0,1	1	10	34	< 0.10	< 0.10	0.14	0.33	< 0.10
Methyl-3 cholanthrene	0,1	1	10	150	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Naphtalene	0,1	5	50	56	< 0.10	< 0.10	0.1	0.24	< 0.10
Phenanthrene	0,1	5	50	56	< 0.10	0.25	0.62	1.77	< 0.10
Pyrene	0,1	10	100	100	< 0.10	< 0.10	0.47	1.2	< 0.10
Methyl-1 naphtalene	0,1	1	10	56	< 0.10	1.24	< 0.10	< 0.10	< 0.10
Methyl-2 naphtalene	0,1	1	10	56	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dimethyl-1,3 naphtalene	0,1	1	10	56	< 0.10	1.19	< 0.10	< 0.10	< 0.10
Trimethyl-2,3,5 naphtalene	0,1	1	10	56	< 0.10	0.45	< 0.10	< 0.10	< 0.10
PH C_{10}-C_{50} - Petroleum hydrocarbons									
PH C_{10}-C_{50}	100	700	3500	10 000	< 100	218	< 100	< 100	< 100
Metals									
Silver (Ag)	2	20	40	200	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Arsenic (As)	6	30	50	250	< 1.5	3.8	3.5	3.9	3.7
Barium (Ba)	340	500	2000	10000	50	55	97	67	117
Cadmium (Cd)	1,5	5	20	100	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Chromium (Cr)	100	250	800	4000	10	16	21	20	17
Cobalt (Co)	25	50	300	1500	< 10	< 10	< 10	10	< 10
Copper (Cu)	50	100	500	2500	< 10	19	25	24	20
Tin (Sn)	5	50	300	1500	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Manganèse (Mn)	1000	1000	2200	11000	350	328	684	454	336
Molybdenum (Mo)	2	10	40	200	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Nickel (Ni)	50	100	500	2500	< 10	21	21	26	23
Lead (Pb)	50	500	1000	5000	21	< 10	15	11	< 10
Selenium (Se)	1	3	10	50	< 0.5	< 0.5	0.6	0.5	< 0.5
Zinc (Zn)	140	500	1500	7500	53	42	76	60	43
MAH - Monocyclic aromatic hydrocarbons									
Benzene	0,2	0,5	5	5	na	< 0.10	na	na	na
Chlorobenzene	0,2	1	10	10	na	< 0.10	na	na	na
1,2-Dichlorobenzene	0,2	1	10	10	na	< 0.15	na	na	na
1,3-Dichlorobenzene	0,2	1	10	10	na	< 0.10	na	na	na
1,4-Dichlorobenzene	0,2	1	10	10	na	< 0.10	na	na	na
Ethylbenzene	0,2	5	50	50	na	0.16	na	na	na
Styrene	0,2	5	50	50	na	< 0.10	na	na	na
Toluene	0,2	3	20	30	na	< 0.20	na	na	na
Total Xylenes	0,4	5	50	50	na	< 0.10	na	na	na
CAH - Chlorinated aliphatic hydrocarbons									
Chloroform	0,2	5	50	50	na	< 0.10	na	na	na
Vinyl chloride (chloroethene)	0,4	-	-	60	na	< 0.40	na	na	na
1,1-Dichloroethane	0,2	5	50	50	na	< 0.10	na	na	na
1,2-Dichloroethane	0,2	5	50	50	na	< 0.15	na	na	na
1,1-Dichloroethene	0,2	5	50	50	na	< 0.10	na	na	na
1,2-Dichloroethene (cis and trans)	0,2	5	50	50	na	< 0.10	na	na	na
Dichloromethane	0,3	5	50	-	na	< 0.15	na	na	na
1,2-Dichloropropane	0,2	5	50	50	na	< 0.10	na	na	na
1,3-Dichloropropene (cis and trans)	0,2	5	50	50	na	< 0.10	na	na	na
1,1,2,2-Tetrachloroethane	0,2	5	50	60	na	< 0.10	na	na	na
Tetrachloroethene	0,3	5	50	50	na	< 0.10	na	na	na
Carbon tetrachloride	0,1	5	50	50	na	< 0.10	na	na	na
1,1,1-Trichloroethane	0,2	5	50	50	na	< 0.10	na	na	na
1,1,2-Trichloroethane	0,2	5	50	50	na	< 0.15	na	na	na
Trichloroethene	0,2	5	50	50	na	< 0.10	na	na	na

Notes:

0.7	: Concentration in the "A-B" range of the Guide's criteria and lower or equal to the LPRR's Schedule I limit value
6	: Concentration in the "B-C" range of the Guide's criteria and higher than the LPRR's Schedule I limit value, but lower than the LPRR's Schedule II limit value
300	: Concentration higher than "C" criteria of the Guide and higher than the to the LPRR's Schedule II limit value, but lower than the RBCS's Schedule I limit value
300	: Concentration higher or equal to the RBCS's Schedule I limit value

1 Level A of the generic criteria for soils of MEFCC's *Guide for Soil Protection and Contaminated Site Rehabilitation*
2 Level B of the generic criteria for soils | Corresponding to limit values of *Land Protection and Rehabilitation Regulation*'s Schedule I (LPRR)
3 Level C of the generic criteria for soils | Corresponding to limit values of LPRR's Schedule II
4 Limit values of *Regulation respecting the burial of contaminated soils*'s Schedule I
na: not analyzed | **nc:** no established criterion

eurofins | EnvironeX 2325, boul. Fernand-Lafontaine, Longueuil (Québec) J4N 1N7 (514) 332-6001

CERTIFICAT D'ANALYSES OFFICIEL : M1629380-V1

DEMANDE D'ANALYSE :132893

Date d'émission du certificat : 2019-12-10

GROUPE ABS
7950, Vauban
Montréal, Québec
H1J2X5
Attention : Catherine Daigneault

Date de réception : 2019-12-03
Nom et no projet : UC-19-2742
Nom du préleveur : Rabbah Guérib et Benjamin Massé
Bon de commande : 04-16699

Analyses	Quantité	Méthode de référence	Méthode interne
Humidité / siccité	5	MA.100- S.T. 1.1	ILCE-030
Hydrocarbures pétrol. C10-C50	5	MA.400-Hyd.1.1	ENVXCHM38/ILCE36
Hydrocarbures Aromatiques Polycycliques (HAP)	5	MA.400 - HAP 1.1	ILCE-061
Balayage de métaux par ICPMS	5	MA.200-Mét 1.2	ILCE-069

Notes :

- Ce certificat d'analyse est la seule référence valide et les résultats présentés ont préséance en cas de différence avec tous autres documents transmis .
- Tous les résultats d'analyses provenant de matrice solide sont calculés sur une base sèche , à moins d'avis contraire.
- Les critères présentés sur ce certificat, le cas échéant, ainsi que la comparaison des résultats d'analyses à ceux-ci est à titre indicatif seulement. De plus, les critères ABC se réfèrent aux critères du secteur Basses-Terres du Saint-Laurent, à moins d'avis contraire.
- Groupe EnvironeX détient toutes les accréditations requises pour l'analyse des paramètres présentés sur ce certificat, à moins d'avis contraire.

Légende :

LR : Limite rapportée
MR : Matériaux de référence
N/A : Non applicable
PNA : Paramètre non accrédité
TNI : Colonies trop nombreuses pour être identifiées
TNC : Colonies trop nombreuses pour être comptées
Méthode Interne : CHM ou MBIO (méthodes QC) ; ILCE ou ILME (méthodes LG)

[1] Analyse réalisée par EnvironeX Québec
[2] Analyse réalisée par EnvironeX Longueuil
[3] Résultats en annexe
* Analyse réalisée en sous-traitance externe

CERTIFICAT D'ANALYSES OFFICIEL - RÉSULTATS

					No d'échantillon EnvironeX :	**4405964**	**4405976**	**4405983**	**4405987**	**4405991**
					Nature :	Sol	Sol	Sol	Sol	Sol
					Date de prélèvement :	2019-11-28	2019-11-28	2019-11-29	2019-11-29	2019-11-29
					Identification de l'échantillon client :	19F01-CF-2A	19F01-CF-4	19F02-CF-2	19F02-CF-2 DUP	19F02-CF-4
Paramètre	**Unité**	**Critère A**	**B**	**C**	**RESC**					
Métaux										
Argent (Ag)	mg/Kg	2	20	40	200	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	mg/Kg	6	30	50	250	<1.5	3.8	3.5	3.9	3.7
Baryum (Ba)	mg/Kg	340	500	2000	10000	50	55	97	67	117
Cadmium (Cd)	mg/Kg	1.5	5	20	100	<0.9	<0.9	<0.9	<0.9	<0.9
Chrome (Cr)	mg/Kg	100	250	800	4000	10	16	21	20	17
Cobalt (Co)	mg/Kg	25	50	300	1500	<10	<10	<10	10	<10
Cuivre (Cu)	mg/Kg	50	100	500	2500	<10	19	25	24	20
Étain (Sn)	mg/Kg	5	50	300	1500	<5.0	<5.0	<5.0	<5.0	<5.0
Manganèse (Mn)	mg/Kg	1000	1000	2200	11000	350	328	684	454	336
Molybdène (Mo)	mg/Kg	2	10	40	200	<1.5	<1.5	<1.5	<1.5	<1.5
Nickel (Ni)	mg/Kg	50	100	500	2500	<10	21	21	26	23
Plomb (Pb)	mg/Kg	50	500	1000	5000	21	<10	15	11	<10
Sélénium (Se)	mg/Kg	1	3	10	50	<0.5	<0.5	0.6	0.5	<0.5
Zinc (Zn)	mg/Kg	140	500	1500	7500	53	42	76	60	43

No d'échantillon EnvironeX :		**4405964**	**4405976**	**4405983**	**4405987**	**4405991**		
Nature :		Sol	Sol	Sol	Sol	Sol		
Date de prélèvement :		2019-11-28	2019-11-28	2019-11-29	2019-11-29	2019-11-29		
Identification de l'échantillon client :		19F01-CF-2A	19F01-CF-4	19F02-CF-2	19F02-CF-2 DUP	19F02-CF-4		
Paramètre	**Unité**							
Pourcentage d'humidité	%	18.6	2.5	2.7	14.2	9.9		

CERTIFICAT D'ANALYSES OFFICIEL - RÉSULTATS

						No d'échantillon EnvironeX :	4405964	4405976	4405983	4405987	4405991
						Nature :	Sol	Sol	Sol	Sol	Sol
						Date de prélèvement :	2019-11-28	2019-11-28	2019-11-29	2019-11-29	2019-11-29
						Identification de l'échantillon client :	19F01-CF-2A	19F01-CF-4	19F02-CF-2	19F02-CF-2 DUP	19F02-CF-4
		Critère									
Paramètre	Unité	A	B	C	RESC						
HAP											
Acénaphtène	mg/Kg	0.1	10	100	100		<0.10	<0.20	<0.10	0.11	<0.10
Acénaphthylène	mg/Kg	0.1	10	100	100		<0.10	<0.10	<0.10	<0.10	<0.10
Anthracène	mg/Kg	0.1	10	100	100		<0.10	<0.10	0.14	0.37	<0.10
Benzo (a) anthracène	mg/Kg	0.1	1	10	34		<0.10	<0.10	0.20	0.49	<0.10
Benzo (a) pyrène	mg/Kg	0.1	1	10	34		<0.10	<0.10	0.19	0.46	<0.10
benzo (b) fluoranthène	mg/Kg	0.1	1	10	-		<0.10	<0.10	0.15	0.35	<0.10
benzo(j)fluoranthène	mg/Kg	0.1	1	10	-		<0.10	<0.10	<0.10	0.21	<0.10
Benzo (k) fluoranthène	mg/Kg	0.1	1	10	-		<0.10	<0.10	<0.10	0.21	<0.10
Benzo (bjk) fluoranthène (Sommation)	mg/Kg	-	-	-	136		<0.10	<0.10	0.15	0.77	<0.10
Benzo (c) phénanthrène	mg/Kg	0.1	1	10	56		<0.10	<0.10	<0.10	<0.10	<0.10
Benzo (g,h,i) pérylène	mg/Kg	0.1	1	10	18		<0.10	<0.10	0.13	0.31	<0.10
Chloro-2-naphtalène (PNA)	mg/Kg	-	-	-	56		<0.10	<0.10	<0.10	<0.10	<0.10
Chrysène	mg/Kg	0.1	1	10	34		<0.10	<0.10	0.22	0.53	<0.10
Dibenzo (a,h) anthracène	mg/Kg	0.1	1	10	82		<0.10	<0.10	<0.10	<0.10	<0.10
Dibenzo (a,h) pyrène	mg/Kg	0.1	1	10	34		<0.10	<0.10	<0.10	<0.10	<0.10
Dibenzo (a,i) pyrène	mg/Kg	0.1	1	10	34		<0.10	<0.10	<0.10	<0.10	<0.10
Dibenzo (a,l) pyrène	mg/Kg	0.1	1	10	34		<0.10	<0.10	<0.10	<0.10	<0.10
Diméthyl-1,3 naphtalène	mg/Kg	0.1	1	10	56		<0.10	1.19	<0.10	<0.10	<0.10
Diméthyl-7,12 benzo (a) anthracène	mg/Kg	0.1	1	10	34		<0.10	<0.10	<0.10	<0.10	<0.10
Fluoranthène	mg/Kg	0.1	10	100	100		<0.10	<0.10	0.59	1.49	<0.10
Fluorène	mg/Kg	0.1	10	100	100		<0.10	0.19	<0.10	0.21	<0.10
Indéno (1,2,3-cd) pyrène	mg/Kg	0.1	1	10	34		<0.10	<0.10	0.14	0.33	<0.10
Méthyl-1 naphtalène	mg/Kg	0.1	1	10	56		<0.10	1.24	<0.10	<0.10	<0.10
Méthyl-2 naphtalène	mg/Kg	0.1	1	10	56		<0.10	<0.10	<0.10	<0.10	<0.10
Méthyl-3 cholanthrène	mg/Kg	0.1	1	10	150		<0.10	<0.10	<0.10	<0.10	<0.10
Naphtalène	mg/Kg	0.1	5	50	56		<0.10	<0.10	0.10	0.24	<0.10
Phénanthrène	mg/Kg	0.1	5	50	56		<0.10	0.25	0.62	1.77	<0.10
Pyrène	mg/Kg	0.1	10	100	100		<0.10	<0.10	0.47	1.20	<0.10
Triméthyl-2,3,5 naphtalène	mg/Kg	0.1	1	10	56		<0.10	0.45	<0.10	<0.10	<0.10
% de récupération des étalons analogues											
d10-acénaphtène	%	-	-	-	-		95	90	87	81	84
d10-phénanthrène	%	-	-	-	-		76	77	77	74	75
D14-Dibenzo (a,h) anthracene	%	-	-	-	-		88	91	91	89	91

						No d'échantillon EnvironeX :	4405964	4405976	4405983	4405987	4405991
						Nature :	Sol	Sol	Sol	Sol	Sol
						Date de prélèvement :	2019-11-28	2019-11-28	2019-11-29	2019-11-29	2019-11-29
						Identification de l'échantillon client :	19F01-CF-2A	19F01-CF-4	19F02-CF-2	19F02-CF-2 DUP	19F02-CF-4
		Critère									
Paramètre	Unité	A	B	C	RESC						
Hydrocarbures pétroliers C10-C50	mg/Kg	100	700	3500	10000		<100	218	<100	<100	<100

CERTIFICAT D'ANALYSES OFFICIEL - RÉSULTATS

Échantillons	Commentaires
4405976	HAP : LR augmentée due à une interférence.

France Luneau, Chimiste, Site Longueuil

CHIMISTE France Luneau 1993-133 QUÉBEC

CERTIFICAT D'ANALYSES OFFICIEL - CONTRÔLE QUALITÉ

Paramètre	Unité	Blanc	LR	MR obtenu %	MR écart acceptable %	Date d'analyse
Métaux	-					
Échantillons EnvironeX associés : **4405964, 4405976, 4405983, 4405987, 4405991**						
Métaux	-					
Argent (Ag)	mg/Kg	<0.50	0.5	89.2%	80 - 120%	2019-12-06
Arsenic (As)	mg/Kg	<1.50	1.5	96.9%	80 - 120%	2019-12-06
Baryum (Ba)	mg/Kg	<10.0	10	101%	80 - 120%	2019-12-06
Cadmium (Cd)	mg/Kg	<0.90	0.9	101%	80 - 120%	2019-12-06
Chrome (Cr)	mg/Kg	<10.0	10	98.2%	80 - 120%	2019-12-06
Cobalt (Co)	mg/Kg	<10.0	10	98.4%	80 - 120%	2019-12-06
Cuivre (Cu)	mg/Kg	<10.0	10	101%	80 - 120%	2019-12-06
Étain (Sn)	mg/Kg	<5.00	5	96.8%	80 - 120%	2019-12-06
Manganèse (Mn)	mg/Kg	<10.0	10	99.2%	80 - 120%	2019-12-06
Molybdène (Mo)	mg/Kg	<1.50	1.5	97.3%	80 - 120%	2019-12-06
Nickel (Ni)	mg/Kg	<10.0	10	97.2%	80 - 120%	2019-12-06
Plomb (Pb)	mg/Kg	<10.0	10	99.0%	80 - 120%	2019-12-06
Sélénium (Se)	mg/Kg	<0.50	0.5	103%	80 - 120%	2019-12-06
Zinc (Zn)	mg/Kg	<10.0	10	101%	80 - 120%	2019-12-06
Échantillons EnvironeX associés : **4405964, 4405976, 4405983, 4405987, 4405991**						
Hydrocarbures pétroliers C10-C50	mg/Kg	<100	100	97%	80 - 120%	2019-12-06
Échantillons EnvironeX associés : **4405964, 4405976, 4405983, 4405987, 4405991**						
HAP	-					
Acénaphtène	mg/Kg	<0.10	0.1	91.4%	60 - 140%	2019-12-06
Acénaphthylène	mg/Kg	<0.10	0.1	85.2%	60 - 140%	2019-12-06
Anthracène	mg/Kg	<0.10	0.1	93.7%	60 - 140%	2019-12-06
Benzo (a) anthracène	mg/Kg	<0.10	0.1	91.5%	60 - 140%	2019-12-06
Benzo (a) pyrène	mg/Kg	<0.10	0.1	79.3%	60 - 140%	2019-12-06
benzo (b) fluoranthène	mg/Kg	<0.10	0.1	82.2%	60 - 140%	2019-12-06
benzo(j)fluoranthène	mg/Kg	<0.10	0.1	79.5%	60 - 140%	2019-12-06
Benzo (k) fluoranthène	mg/Kg	<0.10	0.1	84.5%	60 - 140%	2019-12-06
Benzo (c) phénanthrène	mg/Kg	<0.10	0.1	88.5%	60 - 140%	2019-12-06
Benzo (g,h,i) pérylène	mg/Kg	<0.10	0.1	89.9%	60 - 140%	2019-12-06
Chloro-2-naphtalène (PNA)	mg/Kg	<0.10	0.1	76.1%	60 - 140%	2019-12-06
Chrysène	mg/Kg	<0.10	0.1	87.2%	60 - 140%	2019-12-06
Dibenzo (a,h) anthracène	mg/Kg	<0.10	0.1	78.7%	60 - 140%	2019-12-06
Dibenzo (a,h) pyrène	mg/Kg	<0.10	0.1	82.1%	60 - 140%	2019-12-06
Dibenzo (a,i) pyrène	mg/Kg	<0.10	0.1	90.2%	60 - 140%	2019-12-06
Dibenzo (a,l) pyrène	mg/Kg	<0.10	0.1	78.2%	60 - 140%	2019-12-06
Diméthyl-1,3 naphtalène	mg/Kg	<0.10	0.1	81.0%	60 - 140%	2019-12-06
Diméthyl-7,12 benzo (a) anthracène	mg/Kg	<0.10	0.1	90.0%	60 - 140%	2019-12-06
Fluoranthène	mg/Kg	<0.10	0.1	89.0%	60 - 140%	2019-12-06
Fluorène	mg/Kg	<0.10	0.1	85.3%	60 - 140%	2019-12-06
Indéno (1,2,3-cd) pyrène	mg/Kg	<0.10	0.1	73.0%	60 - 140%	2019-12-06
Méthyl-1 naphtalène	mg/Kg	<0.10	0.1	93.5%	60 - 140%	2019-12-06
Méthyl-2 naphtalène	mg/Kg	<0.10	0.1	68.1%	60 - 140%	2019-12-06
Méthyl-3 cholanthrène	mg/Kg	<0.10	0.1	71.5%	60 - 140%	2019-12-06
Naphtalène	mg/Kg	<0.10	0.1	97.2%	60 - 140%	2019-12-06
Phénanthrène	mg/Kg	<0.10	0.1	90.6%	60 - 140%	2019-12-06

CERTIFICAT D'ANALYSES OFFICIEL - CONTRÔLE QUALITÉ

Paramètre	Unité	Blanc	LR	MR obtenu %	MR écart acceptable %	Date d'analyse
Pyrène	mg/Kg	<0.10	0.1	90.2%	60 - 140%	2019-12-06
Triméthyl-2,3,5 naphtalène	mg/Kg	<0.10	0.1	79.6%	60 - 140%	2019-12-06
% de récupération des étalons analogues	-	-		-		2019-12-06
d10-acénaphtène	%	94		92%	60 - 130%	2019-12-06
d10-phénanthrène	%	79		80%	60 - 130%	2019-12-06
D14-Dibenzo (a,h) anthracene	%	100		97%		2019-12-06
Échantillons EnvironeX associés : **4405964, 4405976, 4405983, 4405987, 4405991**						

eurofins | EnvironeX 2325, boul. Fernand-Lafontaine, Longueuil (Québec) J4N 1N7 (514) 332-6001

CERTIFICAT D'ANALYSES OFFICIEL : M1632061-V1

DEMANDE D'ANALYSE :133177

Date d'émission du certificat : 2019-12-17

GROUPE ABS
7950, Vauban
Montréal, Québec
H1J2X5
Attention : Catherine Daigneault

Date de réception : 2019-12-09
Nom et no projet : UC-19-2742
Nom du préleveur : Rabbah G./Benjamin M.
Bon de commande : 04-16699

Analyses	Quantité	Méthode de référence	Méthode interne
Composés organiques volatils	1	MA.400-COV 1.1	ILCE-022
Humidité / siccité	1	MA.100- S.T. 1.1	ILCE-030

Notes :

- Ce certificat d'analyse est la seule référence valide et les résultats présentés ont préséance en cas de différence avec tous autres documents transmis .
- Tous les résultats d'analyses provenant de matrice solide sont calculés sur une base sèche , à moins d'avis contraire.
- Les critères présentés sur ce certificat, le cas échéant, ainsi que la comparaison des résultats d'analyses à ceux-ci est à titre indicatif seulement. De plus, les critères ABC se réfèrent aux critères du secteur Basses-Terres du Saint-Laurent, à moins d'avis contraire.
- Groupe EnvironeX détient toutes les accréditations requises pour l'analyse des paramètres présentés sur ce certificat, à moins d'avis contraire.

Légende :

LR : Limite rapportée
MR : Matériaux de référence
N/A : Non applicable
PNA : Paramètre non accrédité
TNI : Colonies trop nombreuses pour être identifiées
TNC : Colonies trop nombreuses pour être comptées
Méthode Interne : CHM ou MBIO (méthodes QC) ; ILCE ou ILME (méthodes LG)

[1] Analyse réalisée par EnvironeX Québec
[2] Analyse réalisée par EnvironeX Longueuil
[3] Résultats en annexe
* Analyse réalisée en sous-traitance externe

CERTIFICAT D'ANALYSES OFFICIEL - RÉSULTATS

No d'échantillon EnvironeX :	**4412690**
Nature :	Sol
Date de prélèvement :	2019-11-28
Identification de l'échantillon client :	19F01-CF-4

Paramètre	Unité	Critère A	Critère B	Critère C	Critère RESC	
HAM						
Benzène	mg/Kg	0.2	0.5	5	5	<0.10
Éthylbenzène	mg/Kg	0.2	5	50	50	0.16
Toluène	mg/Kg	0.2	3	30	30	<0.20
Xylènes (m+p)	mg/Kg	-	-	-	-	<0.10
Xylènes (o)	mg/Kg	-	-	-	-	<0.10
Xylènes (sommation)	mg/Kg	0.4	5	50	50	<0.10
Chlorobenzène	mg/Kg	0.2	1	10	10	<0.10
Dichloro-1,2-benzène	mg/Kg	0.2	1	10	10	<0.15
Dichloro-1,3-benzène	mg/Kg	0.2	1	10	10	<0.10
Dichloro-1,4-benzène	mg/Kg	0.2	1	10	10	<0.10
Styrène	mg/Kg	0.2	5	50	50	<0.10
HAC						
Chloroforme	mg/Kg	0.2	5	50	50	<0.10
Chlorure de vinyle	mg/Kg	0.4	0.02	0.03	60	<0.40
Dichloro-1,1-éthane	mg/Kg	0.2	5	50	50	<0.10
Dichloro1,1-éthylène	mg/Kg	0.2	5	50	50	<0.10
Dichloro1,2-éthane	mg/Kg	0.2	5	50	50	<0.15
Dichloro-1,2-éthylène (cis)	mg/Kg	0.2	5	50	50	<0.10
Dichloro-1,2-éthylène (trans)	mg/Kg	0.2	5	50	50	<0.10
Dichloro-1,2-éthylène (cis+trans)	mg/Kg	-	-	-	50	<0.10
Dichloro-1,2-propane	mg/Kg	0.2	5	50	50	<0.10
Dichloro-1,3-propylène (cis)	mg/Kg	0.2	5	50	50	<0.10
Dichloro-1,3-propylène (trans)	mg/Kg	0.2	5	50	50	<0.10
Dichloro-1,3-propylène (cis+trans)	mg/Kg	-	-	-	50	<0.10
Dichlorométhane	mg/Kg	0.3	5	50	50	<0.15
Tétrachloro-1,1,2,2-éthane	mg/Kg	0.2	5	50	50	<0.10
Tétrachloroéthylène	mg/Kg	0.3	5	50	50	<0.10
Tétrachlorure de carbone	mg/Kg	0.1	5	50	50	<0.10
Trichloro-1,1,1-éthane	mg/Kg	0.2	5	50	50	<0.10
Trichloro-1,1,2-éthane	mg/Kg	0.2	5	50	50	<0.15
Trichloroéthylène	mg/Kg	0.2	5	50	50	<0.10
Bromodichlorométhane (PNA)	mg/Kg	-	-	-	150	<0.10
Chloro-2-butadiène-1,3 (PNA)	mg/Kg	-	-	-	2.8	<0.30
Chloroéthane (PNA)	mg/Kg	-	-	-	60	<0.10
Chlorométhane (PNA)	mg/Kg	-	-	-	300	<0.10
Chloro-3-propylène (PNA)	mg/Kg	-	-	-	300	<0.30
Dibromochlorométhane (PNA)	mg/Kg	-	-	-	150	<0.10
Dibromo-1,2-chloro-3-propane (PNA)	mg/Kg	-	-	-	150	<0.20
Dichlorodifluorométhane (PNA)	mg/Kg	-	-	-	72	<0.10
Hexachlorobutadiène (PNA)	mg/Kg	-	-	-	56	<0.20
Hexachloroéthane (PNA)	mg/Kg	-	-	-	300	<0.30
Pentachloroéthane (PNA)	mg/Kg	-	-	-	60	<1.00
Tétrachloro-1,1,1,2-éthane (PNA)	mg/Kg	-	-	-	60	<0.10
Trichlorofluorométhane (PNA)	mg/Kg	-	-	-	300	<0.10
Trichloro-1,2,3-propane (PNA)	mg/Kg	-	-	-	300	<0.15
% de récupération des étalons analogues						

CERTIFICAT D'ANALYSES OFFICIEL - RÉSULTATS

No d'échantillon EnvironeX :	**4412690**
Nature :	Sol
Date de prélèvement :	2019-11-28
Identification de l'échantillon client :	19F01-CF-4

Paramètre	Unité	Critère A	Critère B	Critère C	Critère RESC	
Bromofluorobenzène	%	-	-	-	-	101
d4-dichloroéthane	%	-	-	-	-	111
d8-toluène	%	-	-	-	-	129

No d'échantillon EnvironeX :	**4412690**
Nature :	Sol
Date de prélèvement :	2019-11-28
Identification de l'échantillon client :	19F01-CF-4

Paramètre	Unité	
Pourcentage d'humidité	%	2.5

Échantillons	Commentaires
4412690	COV: Analyse de la reprise réalisée hors du délai de conservation de l'échantillon

Leila Gholami, Chimiste, Site Longueuil

CHIMISTE Leila Gholami 2017011 QUÉBEC

CERTIFICAT D'ANALYSES OFFICIEL - CONTRÔLE QUALITÉ

Paramètre	Unité	Blanc	LR	MR obtenu %	MR écart acceptable %	Date d'analyse
HAM	-					
HAC	-					
	-					
% de récupération des étalons analogues	-					
Échantillons EnvironeX associés : **4412690**						
HAM	-					
Benzène	mg/Kg	<0.10	0.1	91.4%	60 - 140%	2019-12-09
Éthylbenzène	mg/Kg	<0.10	0.1	106%	60 - 140%	2019-12-09
Toluène	mg/Kg	<0.20	0.2	109%	60 - 140%	2019-12-09
Xylènes (m+p)	mg/Kg	<0.10	0.1	119%	60 - 140%	2019-12-09
Xylènes (o)	mg/Kg	<0.10	0.1	114%	60 - 140%	2019-12-09
Xylènes (sommation)	mg/Kg	<0.10	0.1	117%	60 - 140%	2019-12-09
Chlorobenzène	mg/Kg	<0.10	0.1	63.5%	60 - 140%	2019-12-09
Dichloro-1,2-benzène	mg/Kg	<0.15	0.15	76.7%	60 - 140%	2019-12-09
Dichloro-1,3-benzène	mg/Kg	<0.10	0.1	63.1%	60 - 140%	2019-12-09
Dichloro-1,4-benzène	mg/Kg	<0.10	0.1	66.7%	60 - 140%	2019-12-09
Styrène	mg/Kg	<0.10	0.1	97.5%	60 - 140%	2019-12-09
HAC	-					
Chloroforme	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Chlorure de vinyle	mg/Kg	N/A	0.4	N/A	60 - 140%	2019-12-09
Dichloro-1,1-éthane	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichloro1,1-éthylène	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichloro1,2-éthane	mg/Kg	N/A	0.15	N/A	60 - 140%	2019-12-09
Dichloro-1,2-éthylène (cis)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichloro-1,2-éthylène (trans)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichloro-1,2-propane	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichloro-1,3-propylène (cis)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichloro-1,3-propylène (trans)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dichlorométhane	mg/Kg	N/A	0.15	N/A	60 - 140%	2019-12-09
Tétrachloro-1,1,2,2-éthane	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Tétrachloroéthylène	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Tétrachlorure de carbone	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Trichloro-1,1,1-éthane	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Trichloro-1,1,2-éthane	mg/Kg	N/A	0.15	N/A	60 - 140%	2019-12-09
Trichloroéthylène	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
	-					
Bromodichlorométhane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Chloro-2-butadiène-1,3 (PNA)	mg/Kg	N/A	0.3	N/A	60 - 140%	2019-12-09
Chloroéthane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Chlorométhane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Chloro-3-propylène (PNA)	mg/Kg	N/A	0.3	N/A	60 - 140%	2019-12-09
Dibromochlorométhane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Dibromo-1,2-chloro-3-propane (PNA)	mg/Kg	N/A	0.2	N/A	60 - 140%	2019-12-09
Dichlorodifluorométhane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Hexachlorobutadiène (PNA)	mg/Kg	N/A	0.2	N/A	60 - 140%	2019-12-09
Hexachloroéthane (PNA)	mg/Kg	N/A	0.3	N/A	60 - 140%	2019-12-09
Pentachloroéthane (PNA)	mg/Kg	N/A	1	N/A	60 - 140%	2019-12-09
Tétrachloro-1,1,1,2-éthane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09

CERTIFICAT D'ANALYSES OFFICIEL - CONTRÔLE QUALITÉ

Paramètre	Unité	Blanc	LR	MR obtenu %	MR écart acceptable %	Date d'analyse
Trichlorofluorométhane (PNA)	mg/Kg	N/A	0.1	N/A	60 - 140%	2019-12-09
Trichloro-1,2,3-propane (PNA)	mg/Kg	N/A	0.15	N/A	60 - 140%	2019-12-09
% de récupération des étalons analogues	-					
Bromofluorobenzène	%	101		109%	50 - 130%	2019-12-09
d4-dichloroéthane	%	127		71%	50 - 130%	2019-12-09
d8-toluène	%	104		98%	50 - 130%	2019-12-09
Échantillons EnvironeX associés : **4412690**						

CERTIFICAT D'ANALYSES OFFICIEL - CONTRÔLE QUALITÉ

Paramètre	Unité	Blanc	LR	MR obtenu %	MR écart acceptable %	Date d'analyse
HAM	-					
Benzène	mg/Kg	<0.10	0.1	116%	60 - 140%	2019-12-09
Éthylbenzène	mg/Kg	<0.10	0.1	101%	60 - 140%	2019-12-09
Toluène	mg/Kg	<0.20	0.2	100%	60 - 140%	2019-12-09
Xylènes (m+p)	mg/Kg	<0.10	0.1	103%	60 - 140%	2019-12-09
Xylènes (o)	mg/Kg	<0.10	0.1	95.1%	60 - 140%	2019-12-09
Xylènes (sommation)	mg/Kg	<0.10	0.1	100%	60 - 140%	2019-12-09
Chlorobenzène	mg/Kg	<0.10	0.1	105%	60 - 140%	2019-12-09
Dichloro-1,2-benzène	mg/Kg	<0.15	0.15	97.9%	60 - 140%	2019-12-09
Dichloro-1,3-benzène	mg/Kg	<0.10	0.1	101%	60 - 140%	2019-12-09
Dichloro-1,4-benzène	mg/Kg	<0.10	0.1	91.9%	60 - 140%	2019-12-09
Styrène	mg/Kg	<0.10	0.1	84.1%	60 - 140%	2019-12-09
HAC	-					
Chloroforme	mg/Kg	<0.10	0.1	108%	60 - 140%	2019-12-09
Chlorure de vinyle	mg/Kg	<0.40	0.4	112%	60 - 140%	2019-12-09
Dichloro-1,1-éthane	mg/Kg	<0.10	0.1	107%	60 - 140%	2019-12-09
Dichloro1,1-éthylène	mg/Kg	<0.10	0.1	127%	60 - 140%	2019-12-09
Dichloro1,2-éthane	mg/Kg	<0.15	0.15	112%	60 - 140%	2019-12-09
Dichloro-1,2-éthylène (cis)	mg/Kg	<0.10	0.1	112%	60 - 140%	2019-12-09
Dichloro-1,2-éthylène (trans)	mg/Kg	<0.10	0.1	99.1%	60 - 140%	2019-12-09
Dichloro-1,2-propane	mg/Kg	<0.10	0.1	111%	60 - 140%	2019-12-09
Dichloro-1,3-propylène (cis)	mg/Kg	<0.10	0.1	108%	60 - 140%	2019-12-09
Dichloro-1,3-propylène (trans)	mg/Kg	<0.10	0.1	105%	60 - 140%	2019-12-09
Dichlorométhane	mg/Kg	<0.15	0.15	119%	60 - 140%	2019-12-09
Tétrachloro-1,1,2,2-éthane	mg/Kg	<0.10	0.1	124%	60 - 140%	2019-12-09
Tétrachloroéthylène	mg/Kg	<0.10	0.1	96.9%	60 - 140%	2019-12-09
Tétrachlorure de carbone	mg/Kg	<0.10	0.1	97.3%	60 - 140%	2019-12-09
Trichloro-1,1,1-éthane	mg/Kg	<0.10	0.1	95.5%	60 - 140%	2019-12-09
Trichloro-1,1,2-éthane	mg/Kg	<0.15	0.15	113%	60 - 140%	2019-12-09
Trichloroéthylène	mg/Kg	<0.10	0.1	103%	60 - 140%	2019-12-09
	-					
Bromodichlorométhane (PNA)	mg/Kg	<0.10	0.1	111%	60 - 140%	2019-12-09
Chloro-2-butadiène-1,3 (PNA)	mg/Kg	<0.30	0.3	101%	60 - 140%	2019-12-09
Chloroéthane (PNA)	mg/Kg	<0.10	0.1	117%	60 - 140%	2019-12-09
Chlorométhane (PNA)	mg/Kg	<0.10	0.1	96.1%	60 - 140%	2019-12-09
Chloro-3-propylène (PNA)	mg/Kg	<0.30	0.3	115%	60 - 140%	2019-12-09
Dibromochlorométhane (PNA)	mg/Kg	<0.10	0.1	105%	60 - 140%	2019-12-09
Dibromo-1,2-chloro-3-propane (PNA)	mg/Kg	<0.20	0.2	113%	60 - 140%	2019-12-09
Dichlorodifluorométhane (PNA)	mg/Kg	<0.10	0.1	95.7%	60 - 140%	2019-12-09
Hexachlorobutadiène (PNA)	mg/Kg	<0.20	0.2	91.1%	60 - 140%	2019-12-09
Hexachloroéthane (PNA)	mg/Kg	<0.30	0.3	97.1%	60 - 140%	2019-12-09
Pentachloroéthane (PNA)	mg/Kg	<1.00	1	107%	60 - 140%	2019-12-09
Tétrachloro-1,1,1,2-éthane (PNA)	mg/Kg	<0.10	0.1	113%	60 - 140%	2019-12-09
Trichlorofluorométhane (PNA)	mg/Kg	<0.10	0.1	102%	60 - 140%	2019-12-09
Trichloro-1,2,3-propane (PNA)	mg/Kg	<0.15	0.15	120%	60 - 140%	2019-12-09
% de récupération des étalons analogues	-					
Bromofluorobenzène	%	77		114%	50 - 130%	2019-12-09
d4-dichloroéthane	%	116		114%	50 - 130%	2019-12-09
d8-toluène	%	93		110%	50 - 130%	2019-12-09

CERTIFICAT D'ANALYSES OFFICIEL - CONTRÔLE QUALITÉ

Paramètre	Unité	Blanc	LR	MR obtenu %	MR écart acceptable %	Date d'analyse
Échantillons EnvironeX associés : **4412690**						