



**LA GRANDE ALLIANCE FEASIBILITY
STUDY – PHASE I**

POTENTIAL BORROW SOURCES
AND QUARRY SITES INVESTIGATION
– POTENTIAL GREVET-CHAPAIS
RAILWAY

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CHAPAIS RAILWAY**

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1.0 Introduction

1.1 General

La Grande Alliance refers to the Memorandum of Understanding (MOU) on the Cree-Québec Sustainable Infrastructure Program in Eeyou Istchee Baie-James, signed between the Cree Nation Government (CNG) and the Government of Québec on February 17, 2020. The purpose of the MOU is to provide a framework for Cree local and regional entities to work closely with relevant Québec government ministries to connect, develop and protect the territory of the Eeyou Istchee Baie-James region of northern Québec in an inclusive and participatory manner. The main objective of La Grande Alliance is to build a promising program for the strategic, predictable, and sustainable development of the territory over a 30-year time horizon.

Infrastructure development is a major component of *La Grande Alliance*. The program aims at improving and building major transportation infrastructure on the territory, including the implementation of a railway alongside the Billy-Diamond Highway to Whapmagoostui, where the construction of a deep-water port is being considered. The current study is divided into three phases. Phase I being carried out by the Vision Eeyou Istchee Consortium, focusing on the feasibility design of the following infrastructures:

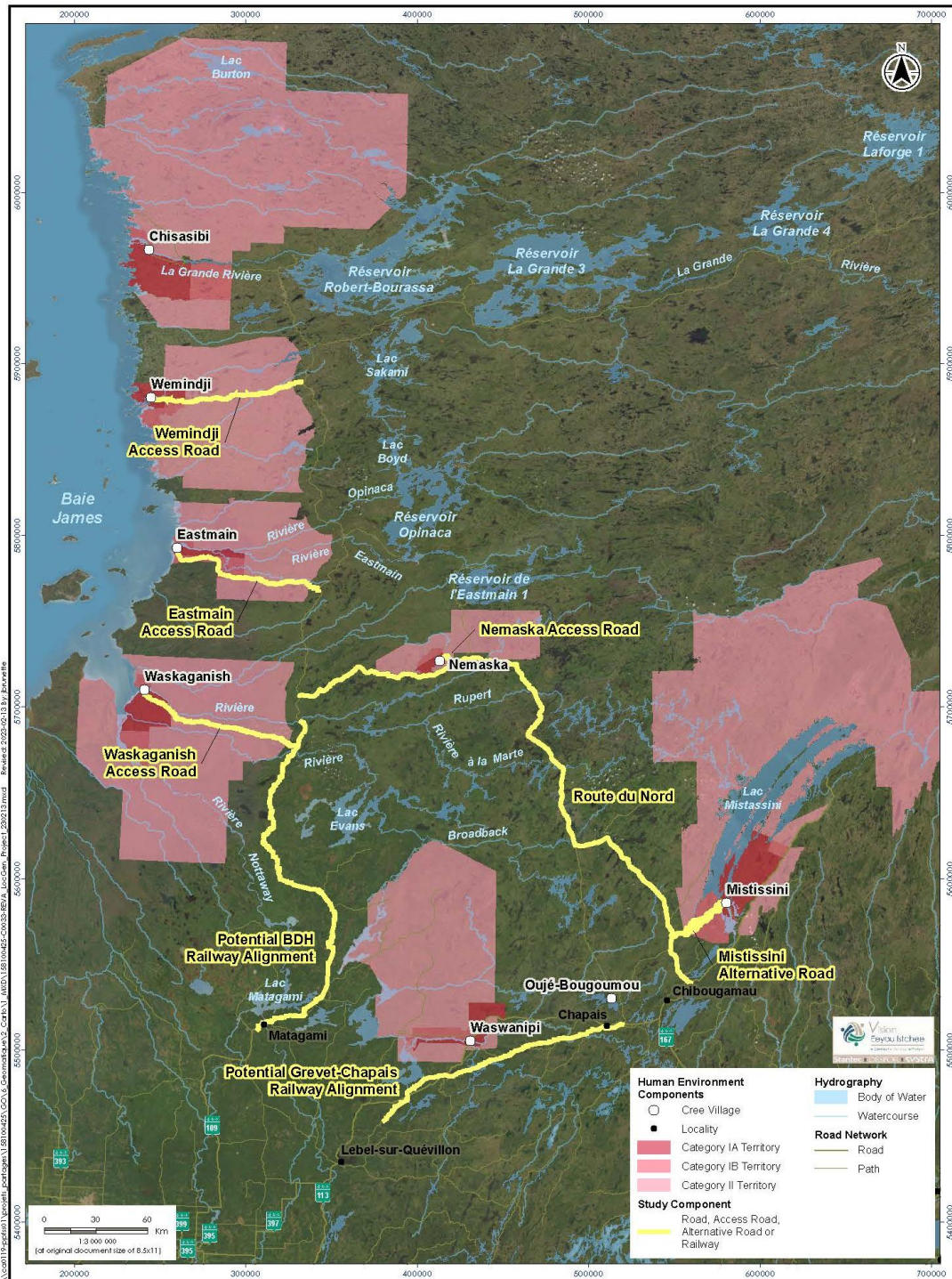
- Upgrade of the existing access roads between the Billy-Diamond Highway (BDH) and the Cree communities of Waskaganish, Eastmain and Wemindji;
- Upgrade of the existing access road between the Route du Nord and the community of Nemaska;
- New railway along the Billy-Diamond Highway (BDH) between the town of Matagami and KP 257 of the same highway (Rupert River Bridge);
- Recommissioning of the railway line from Grevet (Lebel-sur-Quévillon) to Chapais (approximately 225 km);
- Construction of transfer areas along the Billy-Diamond Highway and Grevet-Chapais line corridors, specifically the area at KP 257;
- Upgrade of the Route du Nord, and;
- Construction of a secondary access road to the Cree Nation of Mistissini.

The location of the infrastructures listed above is shown on Figure 1.

Limitations associated with this report and its contents are provided in the Statement of General Conditions included in Appendix A.



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Figure 1 La Grande Alliance – Phase I Feasibility Study Area Overview



1.2 Scope of Work

One of the objectives of the Vision Eeyou Istchee's feasibility study of Phase I was to evaluate the availability of borrow materials (i.e. potential granular borrow sources and quarry sites) to supply the materials needed for the construction and/or upgrade of the different infrastructures. Subsequently, Cree Development Corporation (CDC) mandated Stantec to conduct a geotechnical investigation which includes the exploration of potential borrow sources and quarry sites previously identified within the feasibility study. This report presents the results of the potential borrow sources and quarry sites conducted along the potential Grevet-Chapais railway recommissioning alignment.

The main tasks performed regarding the identification and exploration of potential borrow sources and quarry sites consisted of the:

- Selection and acquisition of aerial photos along the potential Grevet-Chapais railway;
- Reviewing of existing data, reports, and databases regarding the geology and the surficial deposits;
- Photo interpretation and delineation of sectors which appear to present the best potential for aggregate mining (granular materials and bedrock);
- Development of a field investigation program including the identification of test pits and boreholes targets;
- Obtainment of the necessary environmental permits and authorizations to carry out the geotechnical investigation;
- Conduction of the geotechnical field program which includes the:
 - Coordination with subcontractors and tallymen;
 - Forest clearing; and
 - Realization of test pits and boreholes.
- Execution of laboratory testing to characterize the materials (granular materials and bedrock) to determine the suitability for the study needs, and;
- Preparation of this report presenting the results of the characterization of the materials from the investigated potential borrow sources and quarry sites, including an estimate of the potentially extractable volumes.



1.3 Material Requirements

Preliminary estimates of borrow material required for the construction of the potential Grevet-Chapais railway are presented in Table 1. Note that these estimates consist of compacted volumes and exclude quantities generated from the excavation of road cuts.

Table 1 Summary of the Material Requirements for the Construction of the Potential Grevet-Chapais Railway

Material requirements	Type of materials	Volume (m³)
Ballast (crushed stone)	20 to 50 mm (3/4" to 2")	273 400
Sub-ballast	Granular materials	421 900

The information regarding the type of materials required for the construction of the railway is presented in sections 2.3 and 2.4 of Volume 1 of AREMA (2010).

A variety of materials may be used to produce railroad ballast. The most common materials include granite, trap rock, quartzite and carbonate rocks (ex.: limestone and dolomite). The recommended limit for degradation values (ASTM C131 – Los Angeles) ranges between 25% and 35% depending on the bedrock type.

As for the sub-ballast, materials used for railways are aggregates ordinarily specified, typically used in construction for highway bases and subbases. The sub-ballast should consist of granular materials well graded to prevent its penetration into the subgrade and the penetration of track ballast particles into the sub-ballast materials (AREMA, vol.1, 2010).



2.0 STUDY AREA AND BACKGROUND REVIEW

The potential railway extends from Grevet to Chapais (KP 123 to KP 288 of the potential Grevet-Chapais railway) following the decommissioned Grevet-Chapais railway alignment. The study area has a maximum width of 10 km and consists of an offset of 5 km on each side of the Grevet-Chapais roadbed. Once all problematic areas (environmental and access constraints) are removed, the final study surface is considerably reduced. Potential sites that would require the construction of new access roads crossing major watercourses, waterbodies, and/or wetlands were also avoided when possible. Generally, the 5 km offset was reached when existing access roads were present and the sites easily reachable, otherwise the accessibility constraint was considered too high for the site to be a possible option.

Regional bedrock geology mapping shows that the study area is underlain by Archean bedrock belonging to the Abitibi Sub-province within the Superior Province. Generally, the bedrock encountered along the potential railway path is dominated from west to east by intrusive mafic rocks (gabbro, gabbro-norite, and diorite), volcanic mafic and intermediate rocks (basalt, andesite, and volcanoclastic rocks), tonalite, granodiorite, and granite (tonalitic and granodioritic gneiss), and by metasedimentary rocks (paragneiss, schist, iron formation and marble) (SIGÉOM, 2023).

During the Late Wisconsinan Glaciation (24,000 to 8,000 years before present (BP)), the James Bay region was covered by the Laurentide ice sheet. During this glaciation, large amounts of materials were transported and subsequently deposited as till (morainal deposits) across the region. Following the ice melt, the marine transgression of the Tyrrell Sea occurred around 7,900 BP (Hardy 1977). Glaciolacustrine silt and clay accumulated on the low-lying areas and coarser deposits accumulated along the former Tyrrell Sea shorelines (only in Grevet's vicinity). Peat bogs and fens have accumulated over the glacial and non-glacial deposits, especially over poorly drained glaciolacustrine and morainal (till) deposits.

Locally, the western half of the potential Grevet and Chapais railway is mostly covered with deep-water fine-grained glaciolacustrine sediments while the second half of the alignment (eastern section) is mostly covered with till deposits. At the eastern extremity of the alignment, the sector of Chapais presents a northeast-southwest oriented corridor of glaciofluvial deposits comprising esker ridges and outwash deposits (SIGÉOM, 2023).



3.0 Methodology

3.1 Aerial Photo Interpretation and Identification of Potential Borrow Sources and Quarry Sites

Photo interpretation allows the geomorphologists to assess the study area in three dimensions in order to identify landforms that are likely to contain granular materials. Spatial delineation of potential borrow sources is based on the geomorphologist knowledge of Quaternary deposits and on their ability to identify landforms that could potentially provide suitable granular borrow materials. Within the study area, landforms expected to be favorable for borrow material extraction include glaciofluvial deposits such as esker and outwash deposits, and littoral deposits from the postglacial Tyrrell Sea.

In addition to granular deposits, potential quarry sites were selected by identifying favorable bedrock hills – generally about ten (10) meters above the surrounding terrain – and by delineating areas that could provide significant volumes.

The photo interpretation exercise was completed using a mirror stereoscope for the visualization of black and white 1:50 000 scale aerial photos. The aerial photos used for the assessment were acquired from Natural Resources Canada (2013) - National Air Photo Library (NAPL) and are listed in Table 2.

The potential borrow sources and quarry sites were selected based on their distance from the potential Grevet-Chapais railway or other existing access and spatial distribution in order to limit the costs associated with the construction and/or maintenance of access roads. Special attention was given to avoid apparent environmental constraints such as the proximity of the potential sites to watercourses, waterbodies and wetlands.

The potential borrow sources and quarry sites were identified and drawn directly onto the aerial photographs. These were subsequently scanned and georeferenced and the delineated landforms were digitized using ArcMap© software. Prior to the field investigation, the test pit and borehole locations were determined based on landform topography and areas with a high potential to contain suitable material. Spatial distribution of the test pits is particularly important as the material texture may vary significantly within the same landform.

The potential sites were initially named based on the kilometeric posts (KP) of Road 113. These names were later retained throughout the mandate although they do not reflect the KP of the railroad. The sites are identified by the prefixes GD (Granular Deposit) or Q (Quarry) followed by the kilometer point of their location (i.e.: GD-174 or Q-190.9).



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Table 2 Aerial Photos Used for the Identification of Potential Borrow Sources and Quarry Sites

Year	Roll Number	No. of Aerial Photo	Scale
1970	A21502	95 to 98	1/50 000
1989	A27531	155 to 160	1/50 000
1987	A27150	37 to 42; 154 to 158; 171 to 184	1/50 000
1987	A27147	92 to 103	1/50 000
1987	A27114	28 to 38; 87 to 97	1/50 000

3.2 Environmental Permitting

Before proceeding with the geotechnical investigations, Vision Eeyou Istchee obtained the necessary authorizations and permits for the execution of the work:

- Land use (obtained from the ministère des Ressources naturelles et des Forêts du Québec);
- Tree cutting (obtained from the ministère des Forêts, de la Faune et des Parcs du Québec); and
- Declaration of compliance (submitted to the ministère de l’Environnement, de la Lutte contre les changements climatiques du Québec).

All activities conducted on the territory (land occupancy, land clearing, excavation of test pits and boreholes drilling) were carried out in compliance with the current laws and regulations. In addition, following the fieldwork completion, efforts were made to minimize the work’s impacts on the natural environment.

3.3 Geotechnical Field Investigation

A total of five (5) potentially favorable sites, including two (2) borrow sources, and three (3) quarries were identified based on the desktop assessment to conduct a geotechnical field investigation to evaluate the quantity (volume) and the quality of the materials.

The potential borrow sources fieldwork assessments took place between March 18 and 21, 2022. They consisted in excavating test pits at two (2) potential borrow source locations along the potential Grevet-Chapais railway and Road 113 (GD-174, and GD-222.2). Ten (10) and six (6) tests pits were excavated from the potential sites GD-174 and GD 222.2, respectively, for a total of 16 tests pits.

The test pits were completed using a Komatsu excavator PC290LC. The subsurface stratigraphy encountered at each of the test pits was recorded by Stantec field personnel. The test pits’ depths ranged between 0.20 m and 4.00 m. Samples collected during the investigation were brought back to Stantec’s laboratory for detailed classification and additional testing.



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The potential quarry sites' fieldwork assessment was carried out between August 22nd and 28th, and November 8 and 9, 2022. They consisted in drilling two (2) boreholes at each potential quarry sites Q-190.9 and Q-302 and three (3) boreholes at potential quarry site Q-228, for a total of seven (7) boreholes. Generally, the boreholes were drilled to depths between 8 and 10 m using a track-mounted CME-55 drill rig. The subsurface stratigraphy encountered at each of the boreholes was recorded by Stantec field personnel. When encountered, overburden samples were recovered at regular intervals using a B or N sized split-spoon sampler. Rock coring was rendered in all boreholes using a NQ-size core barrel (with an inner diameter of 63.5 mm) to confirm the type and characteristics of the bedrock. Bedrock samples collected during the investigation were brought back to Stantec's laboratory for detailed classification and additional testing.

3.4 Laboratory Testing

All soils and rock samples transported to Stantec's laboratory were subjected to a detailed visual examination and additional classification by a geologist.

For the potential borrow sources, the samples most representative of the granulometry encountered in each test pit were selected for a grain size analysis (sieving). A total of thirteen (13) samples were analyzed.

Laboratory testing conducted on rock cores represented a total of eleven (11) Micro-Deval tests (LC 21-070) and Los Angeles tests (LC 21-400).

3.5 Calculation of Potential Suitable Material Volume

The volume estimates were calculated by multiplying the potential borrow sources or quarry sites area by the estimated average thickness of suitable materials or exploitable bedrock. The average thickness is based on field investigation results (test pits and boreholes) and on the landform geometry observed while performing the aerial photo interpretation. For some sectors, publicly available digital elevation models derived from the LiDAR data (Données Québec, 2019-2021) or Canadian Digital Surface Models derived from radar data (NRCan, 2000) were used to determine the exploitable thickness of granular material or bedrock. However, a conservative approach was used while estimating the potential volumes to account for the operating realities and to avoid overestimating the material availability.

3.6 Site Potential Classification

The site potential classification consists of a qualitative assessment of the site based on the accessibility, material quality (grain-size distribution, Los Angeles, and Micro-Deval results), potential volumes available, and the effort required to develop the site.

The classification uses four different categories which are defined as:

High – Clean, well-graded sand with variable proportions of gravel, or bedrock suitable for use as high quality aggregates with minimum processing. Presence of significant volumes and easy to access with minimum effort required for site development.



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Good – Good quality material generally consisting of well-graded sand with variable proportions of gravel and limited quantities of silt, or good quality bedrock which could provide good quality aggregates with minimal processing effort. Presence of significant volumes and relatively easy to access with limited effort required for site development.

Fair - Fair quality material consisting generally of poorly graded sand and variable proportions of gravel with or without substantial silt content or fair quality bedrock. Available material volumes are less significant and/or are relatively difficult to access (absence, or existing access requiring significant rehabilitation effort). Materials may require treatment to meet the standards (granulometric specification).

Poor (not suitable) - Poor quality material generally consisting of silty, poorly graded, fine-grained sand with minor gravel, poor-quality bedrock or presence of major extraction constraints (shallow water table, thick overburden, etc.).



4.0 Results

Based on the findings from the photo interpretation, two (2) potential borrow sources and three (3) potential quarries were identified as being more likely to contain suitable material for the rehabilitation of the Grevet-Chapais railway. The potential borrow sources consist of juxtaglacial and littoral landforms, which are common sources of sand and gravel material in the James Bay region. The potential quarry sites usually consist of small bedrock hills which have the potential to provide an approximated mining depth of ± 10 m.

The main characteristics of the potential borrow sources and quarry sites identified are shown in Table 3 while the specific description of each site is presented below.

Site locations as well as test pit and borehole locations are shown on the maps in Appendix B. Detailed descriptions of the test pits and boreholes are presented in the test pit and borehole records in Appendix C. Laboratory test results are shown in Appendix D while a photographic album is presented in Appendix E.



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Table 3 Aerial Photos Used for the Identification of Potential Borrow Sources and Quarry Sites

Site ID	Cell	Centroid Coordinates (NAD 83 CSRS MTM 9)		Status	No. SMS (lease expiration date) ¹	Claim ¹ (expiration date)	Material Type	Area (ha)
		Easting (m)	Northing (m)					
GD-174	-	294 060	5 457 295	Existing	32F07-14 (Expired 2006/12/31)	Yes (2024/02/17)	Sand and gravel	187.7
GD-222.2	A	332 230	5 491 000	New	-	Partially (2023/05/14; 2024/01/14)	Sand	6.7
	B	332 665	5 491420	New	-		Sand	6.6
	C	333420	5 491825	Existing	32F09-2 (Expired 1998/03/31)		Sand	19.5
Q-190.9	-	306435	5 460 075	New	-	Yes (2023/09/18)	Bedrock (Basalt)	11.0
Q-228	-	340 060	5 488 850	New	-	Yes (2024/06/14)	Bedrock (Basalt)	2.5
Q-302	-	392 165	5 510 385	New	-	Yes (2025/03/01)	Bedrock (Migmatite)	7.6

¹ Source : Gestim Plus, 2023



4.1 Potential Borrow Sources (Granular Material)

The following sections (4.1.1 and 4.1.2) present the potential borrow sources identified along the potential Grevet-Chapais railway. The Figure B1 (Appendix B) shows an overview of the potential borrow sources location along the potential Grevet-Chapais railway while a larger scale map for each site (Figures B2 and B3; Appendix B) presents the test pits' locations and their surrounding terrain. The detailed test pit reports are provided in Appendix C while the grain size analysis laboratory results are shown in Appendix D. Appendix E provides a photo album with a photo of each test pit excavation or excavated materials pile.

4.1.1 Potential Borrow Source GD-174

Landform type: Frontal moraine with beach ridges

Material: Sand and gravel

Estimated average material thickness: 6-8 m

Estimated volume: > 4 000 000 m³

Site description:

The potential borrow source GD-174 is located in Grevet, at the very beginning of the potential Grevet-Chapais railway (KP 123). The site consists of a succession of beach ridges arranged in a northwest to southeast orientation. Based on the LiDAR data and the test pit results, those littoral sand and gravel deposits are partially bedrock-controlled. Some material has already been extracted from the northwest extremity of the deposit. Visible open faces show material thicknesses between 7 and 15 m.

This potentially favorable landform for borrow source development consists of one large, elongated cell that is divided by an approximately 50 m-wide powerline ROW (Right-of-way). The section of the site north of the powerline has an area of 37.7 ha, while the one on the south covers an area of 152 ha. The site is densely forested, except for a small area west of the site which was deforested. Some wetlands are located northeast of the site, but they do not pose a regulation problem since the distances are within the legal limits established.

Site access:

This site can easily be accessed through the already existing pit, which has a direct access from the existing road leading to Mine Langlois NYRSTAR.

Field investigation program and laboratory testing:

The field program was carried out on March 18 and 19, 2022 and consisted of excavating ten (10) test pits designated as GD-174-TP22-01 to GD-174-TP22-10 (Figure 2; Appendix B). The test pits' depths ranged between 0.20 m and 4.00 m. Their stratigraphy is summarized in Table 4. A total of eight (8) samples were analyzed. Their proportion of gravel, sand, and fine particles (silt and clay combined) are summarized in Table 5.



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Subsurface conditions:

Ten (10) tests pits were carried out within site GD-174. Their general stratigraphy consisted of a topsoil layer between 0.05 to 0.25 m thick overlying multiple layers of sand with variable proportions of gravel and silts, and with the presence of cobbles up to 3.75 m deep. However, three test pits (GD-174-TP22-02, GD-174-TP22-03, and GD-174-TP22-05) were interrupted by the presence of shallow bedrock (≤ 0.9 m). Following the geotechnical field investigation, the areas in the vicinity of the shallow bedrock test pit locations were excluded from the delineation of the potential borrow source GD-174.

Groundwater conditions:

No water inflow was observed in any of the test pits at the time of the investigation.

Site potential:

High – Former sand and gravel borrow pit with significant volume of suitable materials with the presence of an existing access road. Based on the grain size analysis results, the encountered materials usually present a low proportion of fines.

Table 4 Summary of Observed Stratigraphy for the Potential Borrow Source GD-174

Test pit	Stratigraphy (depth-m)					Depth to bedrock (m)	Water inflow depth (m)
	Topsoil	Fill	Gravel, some sand	Sand, variable proportion of gravel, traces of silt	Sand, some silt to silt and sand		
GD-174-TP22-01	0.00 – 0.20	-	-	0.20 – 3.75	-	-	-
GD-174-TP22-02	0.00 – 0.25	-	-	-	-	0.25	-
GD-174-TP22-03	0.00 – 0.25	-	-	0.25 – 0.90	-	0.90	-
GD-174-TP22-04	0.00 – 0.20	-	0.70 – 1.70	0.20 – 0.70 1.70 – 3.50	-	-	-
GD-174-TP22-05	0.00 – 0.20	-	-	-	-	0.20	-
GD-174-TP22-06	-	0.00 – 1.30	-	1.30 – 4.00	-	-	-
GD-174-TP22-07	0.00 – 0.15	-	-	0.15 – 4.00	-	-	-
GD-174-TP22-08	0.00 – 0.20	-	-	0.20 – 3.70	-	-	-
GD-174-TP22-09	0.00 – 0.20	-	-	0.20 – 1.00 2.00 – 4.00	1.00 – 2.00	-	-
GD-174-TP22-10	0.00 – 0.05	-	-	0.05 – 3.70	-	-	-



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Table 5 Grain Size Analysis Results for the Potential Borrow Source GD-174

Test pit	Sample	Depth (m)	Gravel (%)	Sand (%)	Silt and clay (%)	Soil Classification (USCS)
GD-174-TP22-01	MA-03	2.00-3.00	60.5	38	1.5	GW
GD-174-TP22-04	MA-03	1.70-2.70	36.1	63.1	0.8	SW
GD-174-TP22-06	MA-04	2.30-3.30	2.3	97.5	0.2	SP
GD-174-TP22-07	MA-03	2.30-3.00	0.0	95.7	4.3	SP
GD-174-TP22-08	MA-02	1.00-2.00	47.6	51.6	0.8	SW
GD-174-TP22-09	MA-02	1.00-2.00	0.1	85.1	14.8	SM
GD-174-TP22-09	MA-04	3.00-4.00	0.0	93.4	6.6	SP-SM
GD-174-TP22-10	MA-03	1.70-2.70	33.7	65.7	0.6	SP

4.1.2 Potential Borrow Source GD-222.2

Landform type: Juxtaglacial undulating deposit

Material: Sand and gravel

Estimated average material thickness: 4 m

Estimated volume: Cell A: 40 000 m³

Cell B: 40 000 m³

Cell C: 80 000 m³

Site description:

The potential borrow source GD-222.2 is located approximately 150 m northwest of Road 113 between KP 221 and 224. The site consists of a southwest/northeast oriented undulating juxtaglacial deposits standing at approximately 3 to 10 m of height above the surrounding terrain. The site was divided into three (3) different cells (labelled GD-222.2-A to GD-222.2-C) to better represent the potentially suitable material locations. A small portion of the site has already been exploited (within cell C), but this area was excluded from the estimated volume calculation. All cells combined, the area of GD-222.2 represents an area of 32.8 ha.

The cells are densely forested and are crossed by logging roads. Two large peatlands are located approximately 150 m north of the potential borrow source and cover approximate areas of 250 ha and 0.5 ha, which does not pose a regulation problem since the distance is within the established legal limits. No watercourse or waterbody could represent an environmental constraint near this site.



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Site access:

The site is accessible from two logging trails connected to Road 113. The cells are located a few hundred metres (between 90 and 190 m) from Route 113 along the logging trails. The logging trails would require some rehabilitation works to allow the operation of the site.

Field investigation program and laboratory testing:

The field program was carried out on March 21 and 22, 2022 and consisted of six (6) test pits designated as GD-222.2-TP22-01 to GD-222.2-TP22-06. All test pits were excavated to a depth of 4 m. Their stratigraphy is summarized in Table 6.

A total of five (5) samples were retained for grain size analysis. Their proportion of gravel, sand, and fine particles (silt and clay combined) are summarized in Table 7.

Subsurface conditions:

Cell A: Two (2) test pits were excavated within the cell A (GD-222.2-TP22-02 and GD-222.2-TP22-03). They both contained a fine topsoil layer (0.10 and 0.15 m) followed by layers of sand with variable amounts of silt and gravel up to 4 m deep.

Cell B: The test pit excavated within cell B (GD-222.2-TP22-04) had a stratigraphy consisting of a topsoil layer of 0.15 m thick overlaying a 4 m thick layer of sand with traces of silt.

Cell C: As the cells were subdivided after the geotechnical investigation, no pit tests were performed inside cell C. Nevertheless, the materials should be comparable to those encountered in the other cells. This is also the only cell that has been previously mined.

The encountered stratigraphy in test pit GD-222.2-TP22-01 consists of a topsoil layer of 0.20 m overlying a thick layer of sand with traces of silt and gravel. The vicinity of this test pit was not retained since a small watercourse was identified in the field.

Two other test pits were conducted in areas that have *a posteriori* been excluded from the potential borrow source's cells since their stratigraphy was considered inadequate for granular material borrow sources, as test pits GD-222.2-TP22-05 and GD-222.2-TP22-06 respectively contained a layer of 1.4 m and 2.1 m thick of clay deposits.

Groundwater conditions:

No water inflow or water table was observed in any of the test pits.

Site potential:

Fair to good – The encountered materials are suitable to be used as granular borrow materials and the site is easy to access. However, the site is divided in three (3) cells of variable thickness which could complicate the exploitation of the site.



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Table 6 Summary of Observed Stratigraphy for the Potential Borrow Source GD-222.2

Test pit	Stratigraphy (depth-m)				Water inflow depth (m)
	Topsoil	Sand, variable proportion of gravel, <u>traces of silt</u>	Sand, variable proportion of gravel, <u>some silt to sand and silt</u>	Cohesive deposit	
GD-222.2-TP22-01	0.00 – 0.20	0.20 – 4.00	-	-	-
GD-222.2-TP22-02	0.00 – 0.10	0.10 – 4.00	-	-	-
GD-222.2-TP22-03	0.00 – 0.15	0.15 – 1.00 2.00 – 4.00	1.00 – 2.00	-	-
GD-222.2-TP22-04	0.00 – 0.15	0.15 – 4.00	-	-	-
GD-222.2-TP22-05	0.00 – 0.10	-	1.50 – 4.00	0.10 – 1.50	-
GD-222.2-TP22-06	0.00 – 0.40	-	0.40 – 0.90 3.50 – 4.00	0.90 – 3.50	-

Table 7 Grain Size Analysis Results for the Potential Borrow Source GD-222.2

Test pit	Sample	Depth (m)	Gravel (%)	Sand (%)	Silt and clay (%)	Soil Classification (USCS)
GD-222.2-TP22-01	MA-02	1.00-2.00	0.1	94.9	5.0	SP
GD-222.2-TP22-02	MA-03	2.00-3.00	0.1	99.1	0.8	SP
GD-222.2-TP22-03	MA-02	1.00-2.00	0.0	89.8	10.2	SP-SM
GD-222.2-TP22-03	MA-04	3.00-4.00	0.0	98.9	1.1	SP
GD-222.2-TP22-04	MA-03	2.00-3.00	0.0	93.1	6.9	SP-SM



4.2 Potential Quarry sites

The following sections (4.2.1 to 4.2.3) present the potential quarry sites identified along the potential Grevet-Chapais railway between Grevet Chapais (KP 113 to 288 of the potential Grevet-Chapais railway). Figure B1 (Appendix B) shows an overview of the potential quarry locations along the potential Grevet-Chapais railway, while larger scaled map figures for each site (Figures B4 to B6; Appendix B) present the borehole locations and their surrounding terrain. The detailed borehole reports are provided in Appendix C, the Los Angeles and Micro-Deval laboratory results are shown in Appendix D, while Appendix E provides a photographic album of each rock core.

4.2.1 Potential Quarry Site Q-190.9

Landform type: Rocky hill

Material: Bedrock (Basalt)

Estimated average material thickness: 12-15 m

Estimated volume: 500 000 m³ (575 000 m³ including a swell ratio of 1.15 once compacted)

Site description:

The potential quarry site Q-190.9 is located about 860 m south of the potential Grevet-Chapais railway between KP 142 and 143. It is found on top of a large rocky hill which rises more than 75 m above the railroad. The site itself presents a southwest/northeast orientation with a length of approximately 510 m and width of 200 m. Its area is estimated at approximately 10.6 ha. The rock formation has an approximate height between 10 and 20 m above the surrounding terrain. The site is currently unexploited and does not show any sign of anthropic disturbances in its immediate surroundings. It is partially forested i.e. approximately half of the site area is covered by vegetation while the other half shows exposed bedrock. No hydrographic features or wetlands that could affect the potential exploitable volume or pose environmental constraints were observed in the vicinity of the site.

Site access:

There is currently no access to reach the proposed quarry location. A path has already been deforested from the potential Grevet-Chapais railway to the site to allow passage for the drilling equipment, but an access road of approximately 1050 m would be required from the potential Grevet-Chapais railway to allow the exploitation of the site.

Field investigation program and laboratory testing:

Two (2) boreholes (Q-190.9-BH22-01 and Q-190.9-BH22-02) were drilled on site on November 8, 2022. Their depths reached 10.24 m and 10.67 m, respectively. Following the description of the bedrock cores by a geologist, representative samples of rock were selected to conduct two (2) Micro-Deval tests (LC 21-070), and two (2) Los Angeles tests (LC 21-400) for each borehole.



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Subsurface conditions:

The boreholes Q-190.9-BH22-01 and Q-190.9-BH22-02 both showed grey-blue basalt bedrock of poor to excellent quality (RQD). While the first borehole only showed bedrock from the surface of the ground to a depth of 10.24 m, the second one showed a layer of cobbles and boulders from the surface of the ground to 0.93 m deep overlying basaltic bedrock 10.67 m deep. A summary of the encountered stratigraphy at each borehole is presented in Table 8.

The Micro-Deval values ranged from 5 % to 9 %, while the Los Angeles values ranged from 10 % to 13 %, indicating suitable rock quality for the ballast and sub ballast materials. The laboratory test results are presented in Table 9.

Site potential:

Good - The encountered bedrock appears to be suitable to produce significant volumes of ballast and sub-ballast materials, but the exploitation of the site would require the construction of a new 1 050 m long access road.

Table 8 Summary of the Encountered Stratigraphy for Potential Quarry Site Q-190.9

Borehole ID	Total depth (m)	Stratigraphy (depth-m)	
		Cobbles and boulders	Basalt
Q-190.9-BH22-01	10.24	-	0.00 – 10.24
Q-190.9-BH22-02	10.67	0.00 – 0.93	0.93 – 10.67

Table 9 Laboratory Results for Potential Quarry Site Q-190.9

Borehole ID	Sample	Depth (m)	Geotechnical laboratory test results	
			Micro-Deval (%) (LC 21-070)	Los Angeles (%) (LC 21-400)
Q-190.9-BH22-01	DC-02 to DC-04	1.22 – 5.87	5	11
Q-190.9-BH22-01	DC-05 to DC-08	5.87 – 10.24	5	10
Q-190.9-BH22-02	DC-02 to DC-05	1.37 – 5.00	5	10
Q-190.9-BH22-02	DC-06 to DC-09	5.00 – 9.83	9	13



4.2.2 Potential Quarry Site Q-228

Landform type: Rounded rocky hill

Material: Bedrock (Basalt)

Estimated average material thickness: 10 - 12 m

Estimated volume: 125 000 m³ (~140 000 m³ including a swell ratio of 1.15 once compacted)

Site description:

The potential quarry site labelled Q-228 is situated approximately 350 m south of the KP 185.8 of the potential Grevet-Chapais railway. The site consists of rounded rocky hill of approximately 150 m long by 150 m wide and covers an area of about 2.5 ha. Its elevation is about 20 – 25 m above the surrounding terrain. The site is currently unexploited and densely forested, except for a ~230 m long and ~4 m wide path that was deforested to allow passage for the drill during the field investigation of this study.

No environmental constraints have been identified in the vicinity of the potential quarry site. The areas surrounding the bedrock-controlled hills are covered with fine glaciolacustrine deposits.

Site access:

This potential quarry site can be accessed from a forest road located approximately 280 m from the west side of the site. From the extremity of this road, a smaller logging trail allows to reach the site. However, an access road would have to be constructed to reach the existing forest road. Otherwise, the potential railway alignment could be reached directly from the site by converting an existing logging trail (unknown condition) into an access road of about 400 m long.

Field investigation program and laboratory testing:

Three (3) boreholes (Q-228-BH22-01, Q-228-BH22-02, and Q-228-BH22-03) were drilled between August 22 and 26, 2022. The boreholes reached depths of 7.19, 10.16, and 8.05 m, respectively, while the bedrock was intersected at approximate depths of 5.61 m, 0.23 m, and 0.36 m, respectively. The third borehole was drilled between the first two ones due to inadequate conditions for quarry development encountered within the first borehole. Their stratigraphy is presented in Table 10.

For borehole Q-228-BH-02, two (2) Micro-Deval and two (2) Los Angeles tests were conducted while for borehole Q-228-BH-03, one (1) Micro-Deval and one (1) Los Angeles tests were conducted. Laboratory results are presented in Table 11.

Subsurface conditions:

The westernmost borehole of this potential quarry site, Q-228-BH22-01, showed a thick cover of overburden before reaching the bedrock at the approximate depth of 5,61 m. The boreholes Q-228-BH22-02 and Q-228-BH22-03 showed an overburden thickness of 0.23 and 0.36 m, respectively. The bedrock consists of a grey to grey and white basalt where various inclusions (mainly granitic) were locally observed (Q-228-BH22-03). A summary of the encountered stratigraphy at each borehole is presented in Table 10.



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The laboratory test results for the selected samples from the boreholes showed that Micro-Deval values range from 4 to 10 %, while the Los Angeles results ranged from 11 to 14 % which indicate the bedrock is suitable to produce various types of aggregates. The laboratory test results are presented in Table 11.

Considering the inappropriate overburden thickness at the location of Q-228-BH22-01, the sector was excluded from the delineated site.

Site potential:

High - The site contains a significant volume of suitable bedrock to be used as construction materials and is relatively easy to access. Although, the construction of an access road of approximately 280 m (or 400 m to directly reach the potential railway alignment) would be required.

Table 10 Summary of the Encountered Stratigraphy for Potential Quarry Site Q-228

Borehole ID	Total depth (m)	Stratigraphy (depth-m)				
		Organic matter	Sand with some to traces of silt and traces of gravel	Sand with some silt and gravel	Till	Basalt
Q-228-BH22-01	7.19	0.00 – 0.10	0.10 – 1.98		1.98 – 5.61	5.61 – 7.19
Q-228-BH22-02	10.16	0.00 – 0.08		0.08 – 0.23		0.23 – 10.16
Q-228-BH22-03	8.05	0.00 – 0.18		0.18 – 0.36		0.36 – 8.05

Table 11 Laboratory Results for Potential Quarry Site Q-228

Borehole ID	Sample	Depth (m)	Geotechnical laboratory test results	
			Micro-Deval (%) (LC 21-070)	Los Angeles (%) (LC 21-400)
Q-228-BH22-02	DC-02 to DC-05	0.23 – 5.89	10	14
Q-228-BH22-02	DC-06 to DC-08	5.89 – 10.16	7	11
Q-228-BH22-03	DC-04 to DC-09	2.34 – 8.05	4	14



4.2.3 Potential Quarry Site Q-302

Landform type: Rounded rocky hill

Material: Bedrock (Migmatite)

Estimated average material thickness: 12-15 m

Estimated volume: 500 000 m³ (575 000 m³ including a swell ratio of 1.15 once compacted)

Site description:

The potential quarry site Q-302 is located approximately 1.9 km north of KP 243.2 of the potential Grevet-Chapais railway. The site itself reaches an elevation approximately 25 m above the surrounding terrain. The site is roughly 250 m long by 250 m wide and covers an area of 7.6 ha. The potential site and its vicinity have not yet been exploited for quarry purposes and are partially forested. The surroundings beyond this rocky hill are covered with till deposits overlying bedrock. A small water body is located approximately 180 m to the east of the site while a peatland is located 100 m south of the potential quarry. Both do not represent environmental constraints for the exploitation of the site based on the current legislation.

Site access:

The potential quarry site Q-302 can be accessed through a logging trail approximately 2.5 km long north of KP 243.2 of the potential Grevet-Chapais railway. The existing trail would require improvement works to be converted in an access road. A new east-west oriented segment of approximately 120 m would also be required to connect the site to the existing trail.

Field investigation program and laboratory testing:

Two (2) boreholes (Q-302-BH22-01 and Q-302-BH22-02) were drilled on site on August 27th and 28th, 2022. The boreholes' depths reached 10.79 m (Q-302-BH22-01) and 10.57 m (Q-302-BH22-02) and the bedrock was intersected at an approximate depth of 0.38 m and 0.30 m, respectively. Their stratigraphy is presented in Table 12.

For each borehole, two (2) Micro-Deval and two (2) Los Angeles tests were conducted. Laboratory results are presented in Table 13.

Subsurface conditions:

The first borehole drilled on this potential quarry site (Q-302-BH22-01) showed a thin layer of sand before reaching the bedrock, while the second one had a thin layer of organic matter before reaching the bedrock. The bedrock encountered at both boreholes was grey to pink migmatite of fair to excellent quality, and reached depths below 10.5 m. A summary of both boreholes' stratigraphy is presented in Table 12.

The laboratory test results for the selected samples from the boreholes showed that the Micro-Deval results varied from 8 to 10 %, while the Los Angeles results ranged from 19 to 25 % indicating that the bedrock is suitable to produce various types of aggregates (Table 13).



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Site potential:

Good - The encountered bedrock appears to be suitable to produce significant volumes of ballast and sub-ballast materials, but the exploitation of the site would require the construction of a new relatively long access road.

Table 12 Summary of the Encountered Stratigraphy for Potential Quarry Site Q-302

Borehole ID	Total depth (m)	Stratigraphy (depth-m)	
		Organic matter	Migmatite
Q-302-BH22-01	10.79	0.00 – 0.38	0.38 – 10.79
Q-302-BH22-02	10.57	0.00 – 0.30	0.30 – 10.57

Table 13 Laboratory Results for Potential Quarry Site Q-302

Borehole ID	Sample	Depth (m)	Geotechnical laboratory test results	
			Micro-Deval (%) (LC 21-070)	Los Angeles (%) (LC 21-400)
Q-302-BH22-01	DC-02 to DC-04	1.07 – 5.69	8	21
Q-302-BH22-01	DC-05 to DC-07	5.69 – 9.22	8	19
Q-302-BH22-02	DC-02 to DC-05	0.30 – 5.69	10	24
Q-302-BH22-02	DC-05 to DC-09	5.69 – 10.57	9	25



5.0 Discussion and Conclusion

This geotechnical investigation was undertaken to identify potential borrow sources and quarry sites to comply with the material needs for the recommissioning of the Grevet-Chapais railway between Grevet (near Lebel-sur-Quévillon) and Chapais.

Using aerial photo interpretation, two (2) potential borrow sources (granular material) and three (3) potential quarry sites (bedrock) were identified for further geotechnical investigations. Test pits and boreholes were then performed to describe the surficial material and bedrock as well as the presence of unsuitable material layers and water inflow. Samples of sediments and rock cores were collected for additional classification by a geologist and for laboratory testing. The results of the desktop assessment, geotechnical field investigation and laboratory results allowed to estimate the quality and quantity (volume) of potential available materials. Table 14 summarizes the potential exploitable volumes identified along the potential Grevet-Chapais railway.

Table 14 Summary of the Potentially Exploitable Volumes Identified Along the Potential Grevet-Chapais Railway

Site ID	Material Type	Estimated average material thickness (m)	Potential volume with respect to environmental constraints (m ³)	Potential bedrock volume considering a swell ratio of 1.15 (once compacted)
GD-174	Sand and gravel	6 – 8	> 4 000 000	N/A
GD-222.2-A	Sand	4	40 000	
GD-222.2-B	Sand	4	40 000	
GD-222.2-C	Sand	4	80 000	
Q-190.9	Bedrock	12 - 15	500 000	575 000
Q-228	Bedrock	10 - 12	125 000	140 000
Q-302	Bedrock	12 - 15	500 000	575 000
Total - Granular materials (m ³)	> 4 160 000 m ³ considering environmental constraints ¹			
Total - Bedrock	1 290 000 m ³ (including a swell ratio of 1.15 once compacted)			

The potential borrow source GD-174 consists of a thick deposit of sand with variable proportions of gravel and a low proportion of fines (silt and clay). The deposit could provide suitable material to produce MG 112 since most of the materials seem to contain less than 10% of sediment finer than 0.08 mm. The site is easily accessible by an existing road and located less than 200 m of the potential railway. Its only flaw is to be located at the western extremity of the potential railway which is less cost-efficient regarding material transportation.



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The three cells (GD-222.2 A to C) of the potential borrow source GD-222.2 seem to contain suitable sandy materials to produce MG 112 since most of the encountered materials contain less than 10% of sediment finer than 0.08 mm. The site is located approximately 7.2 km from the railway alignment but remains easily accessible by using Road 113. However, to take full advantage of the site, it would be necessary to proceed with the opening of three (3) separate cells.

A total of three (3) potential quarry sites were explored during the geotechnical investigation. They are located in the surroundings of KP 142 (Q-190.9), KP 186 (Q-228), and KP 243 (Q-302). All of them consist of new unexploited sites. The laboratory results tend to show that the drilled bedrock is suitable for the three sites for the production of ballasts and sub-ballast materials.

Based on the actual material requirements for the return to service of the Grevet-Chapais railway, it seems that the delineated potential borrow sources and quarry sites would be sufficient to meet the needs. However, further investigation could be conducted to reduce costs related to material transport. Finally, it must be noted that the location and the exploitation of borrow pits and quarries are submitted to the Regulation respecting sand pits and quarries (Chapter Q-2, r 7.1) of the Environment Quality Act. The final selection and delineation of the selected sites should be done according to the applicable regulations in effect at that time.



6.0 References

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APPENDICES

Appendix A Statement of General Conditions



STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Experts-conseils and the Client. Any use which a third party makes of this report is the responsibility of such third party.

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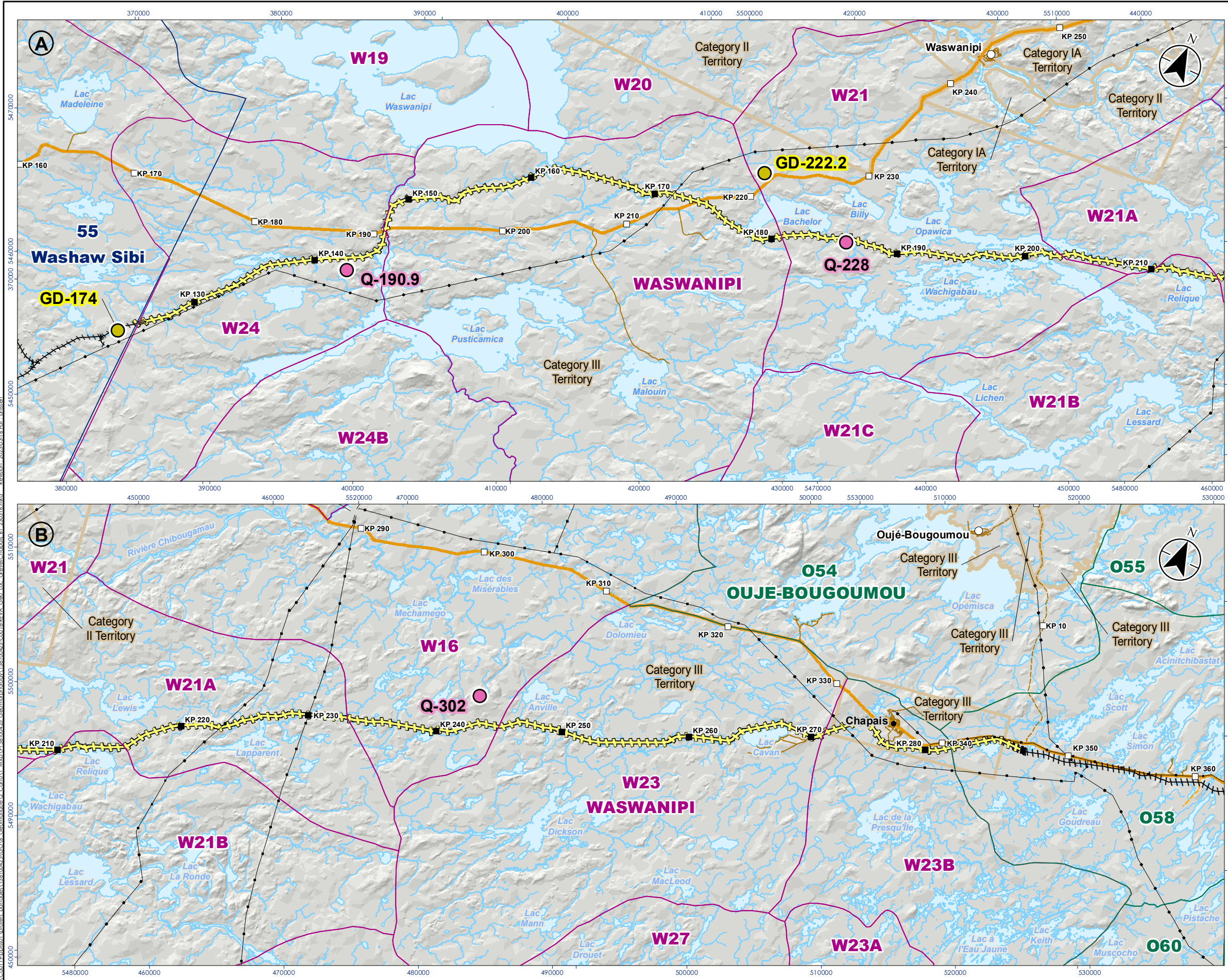
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Experts-conseils at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Experts-conseils must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Experts-conseils will not be responsible to any party for damages incurred as a result of failing to notify Stantec Experts-conseils that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Experts-conseils, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Experts-conseils cannot be responsible for site work carried out without being present.

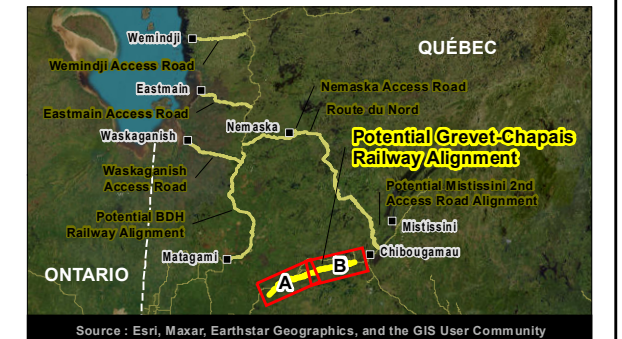
Appendix B Figures





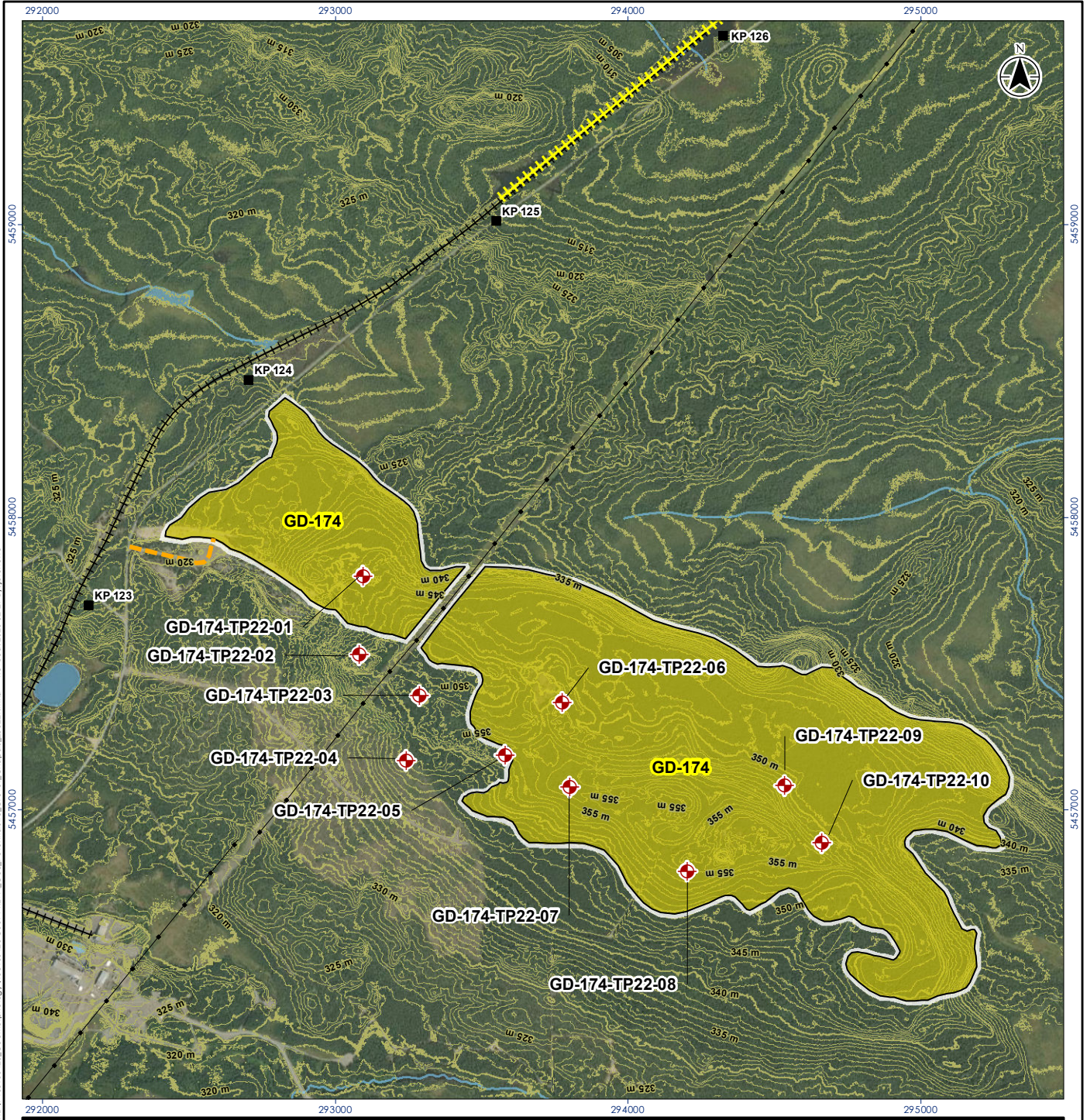
Map No. **B1**
 Title **Potential Borrow Sources and Quarry Sites
 Potential Grevet-Chapais Railway**
 Client/Project
 Cree Development Corporation
 La Grande Alliance – Feasibility Study
 Phase 1
 Project Location
 Eeyou Itchee,
 Québec
 158100425-C0018 REVA
 Prepared by Julie Brunette on 2023-03-16
 Verified by E. Ferland on 2023-03-16
 Independent Review by F. Vinet on 2023-03-16

- Human Environment Component**
- Cree Village
 - Locality
 - Category I, II or III Territory
 - Power Line
 - Railway
- Projected Component**
- Potential Grevet-Chapais Railway Alignment
 - Railway Kilometric Point (Systra, February 2023)
- Potential Material Source**
- Potential Quarry Site (Q)
 - Potential Borrow Source (GD)
- Trapline Limit and Community Name**
- Ouje-Bougoumou
 - Washaw Sibi
 - Waswanipi
- Hydrography**
- Body of water
 - Intermittent Watercourse
 - Permanent Watercourse
- Road Network**
- Kilometric Point (MTQ, 2021)
- Road Classification**
- National / Regional
 - Collector
 - Local
 - Access Path
- 0 3 6 km
 1:300 000
 (At original document size of 11x17)



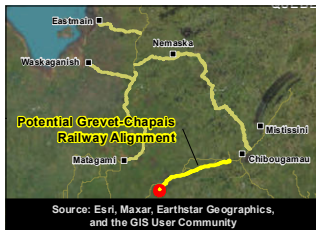
- Notes**
- Coordinate System: NAD 1983 UTM Zone 18N
 - Geotechnical Investigation: Stantec, 2023
 - Road Network: Adresses Québec, 2021
 - Hydrography: GRHQ, 2017
 - Orthoimagery: ESRI-World Imagery, 2017





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 Reviewed: 2023-02-21 By: Brunette
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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Notes
 1. Coordinate System: NAD 1983 CSRS MTM 9
 2. Geotechnical Investigation: Stantec, 2023
 3. Road Network: Adresses Québec, 2023
 4. Hydrography: GRHQ, 2017
 5. Topography: Forêt Ouverte, 2023
 6. Orthomogery: ESRI-World Imagery, 2017

Human Environment Component

- Power Line
- ++++ Railway
- Projected Component**
- ++++ Potential Grevet-Chapais Railway Alignment
- Proposed Access Road
- Railway Kilometric Point (Systra, February 2023)

Potential Material Source

- Potential Borrow Source (GD)

Geotechnical Investigation

- ◆ Test pit

Hydrography

- Body of Water
- Watercourse

Topography

- Contour line (1 m)
- Primary
- Secondary



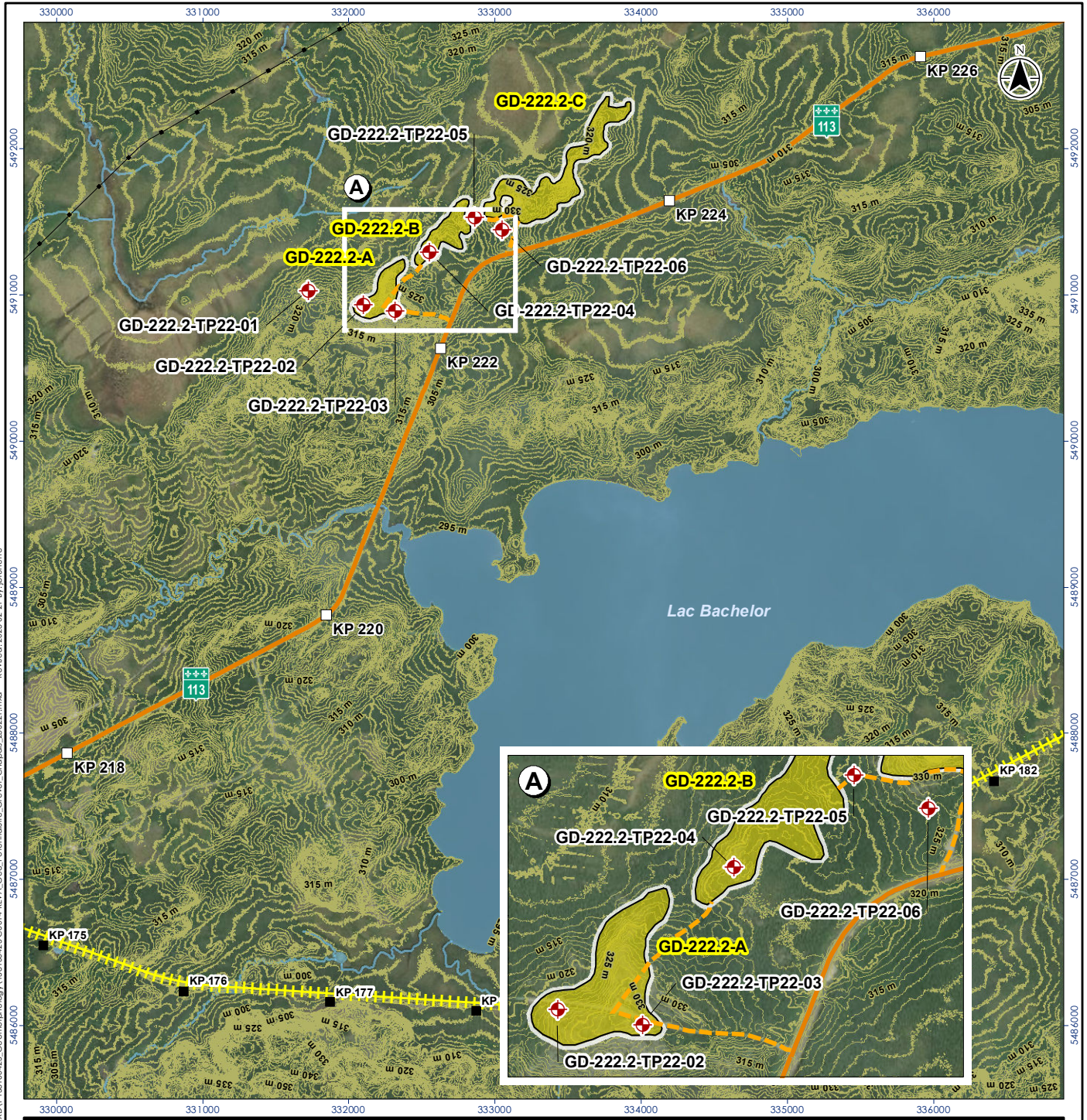
Project Location: 158100425-C008 REV A
 Eeyou Istchee, Québec
 Prepared by J. Brunette on 2023-02-21
 Technical Review by E. Ferland on 2023-02-21
 Independent Review by F. Vinet on 2023-02-21

Client/Project: Cree Development Corporation
 La Grande Alliance – Feasibility Study
 Phase 1

Map No.: **B2**

Title: **Potential Borrow Source GD-174**

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 Revised: 2023-02-21 By: Brunette



- Human Environment Component**
- Power Line
- Projected Component**
- Potential Grevet-Chapais Railway Alignment
 - Proposed Access Road
 - Railway Kilometric Point (Systra, February 2023)
- Potential Material Source**
- Potential Borrow Source (GD)
- Geotechnical Investigation**
- Test pit

- Road Network**
- Kilometric Point (MTQ, 2021)
- Road Classification**
- National/Regional
- Hydrography**
- Body of Water
 - Watercourse
- Topography**
- Contour line (1 m)
 - Primary
 - Secondary



Project Location: 158100425-C0008 REV A
 Eeyou Itchee, Québec
 Prepared by J. Brunette on 2023-02-21
 Technical Review by E. Ferland on 2023-02-21
 Independent Review by F. Vinet on 2023-02-21

Client/Project: Cree Development Corporation
 La Grande Alliance – Feasibility Study
 Phase 1

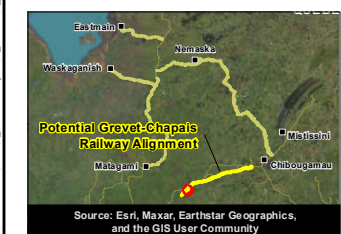
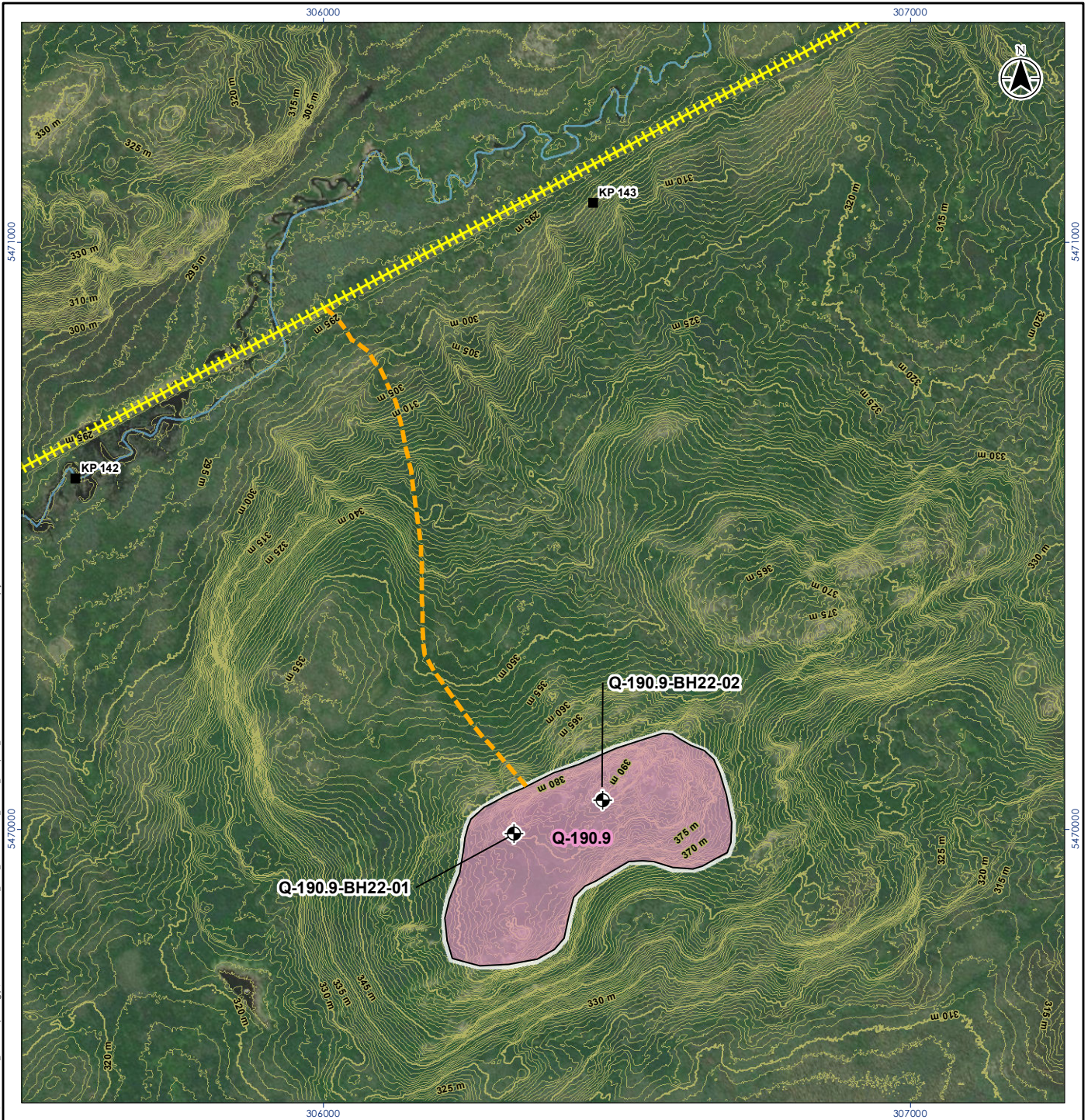
Map No.: B3
 Title: Potential Borrow Source GD-222.2

Notes




- Coordinate System: NAD 1983 CSRS MTM 9
- Geotechnical Investigation: Stantec, 2023
- Road Network: Adresses Québec, 2023
- Hydrography: GRHQ, 2017
- Topography: Forêt Ouverte, 2023
- Orthoimagery: ESRI-World Imagery, 2017

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Projected Component

-  Potential Grevet-Chapais Railway Alignment
-  Proposed Access Road
-  Railway Kilometric Point (Systra, February 2023)



Potential Material Source

-  Potential Quarry Site (Q)



Geotechnical Investigation

-  Borehole

Hydrography

-  Body of Water
-  Watercourse

Topography

- Contour line (1 m)**
-  Primary
-  Secondary



Project Location: 158100425-C008 REV A
 Prepared by J. Brunette on 2023-02-21
 Eeyou Ictchee, Québec
 Technical Review by E. Ferland on 2023-02-21
 Independent Review by F. Vinet on 2023-02-21

Client/Project: Cree Development Corporation
 La Grande Alliance – Feasibility Study
 Phase 1

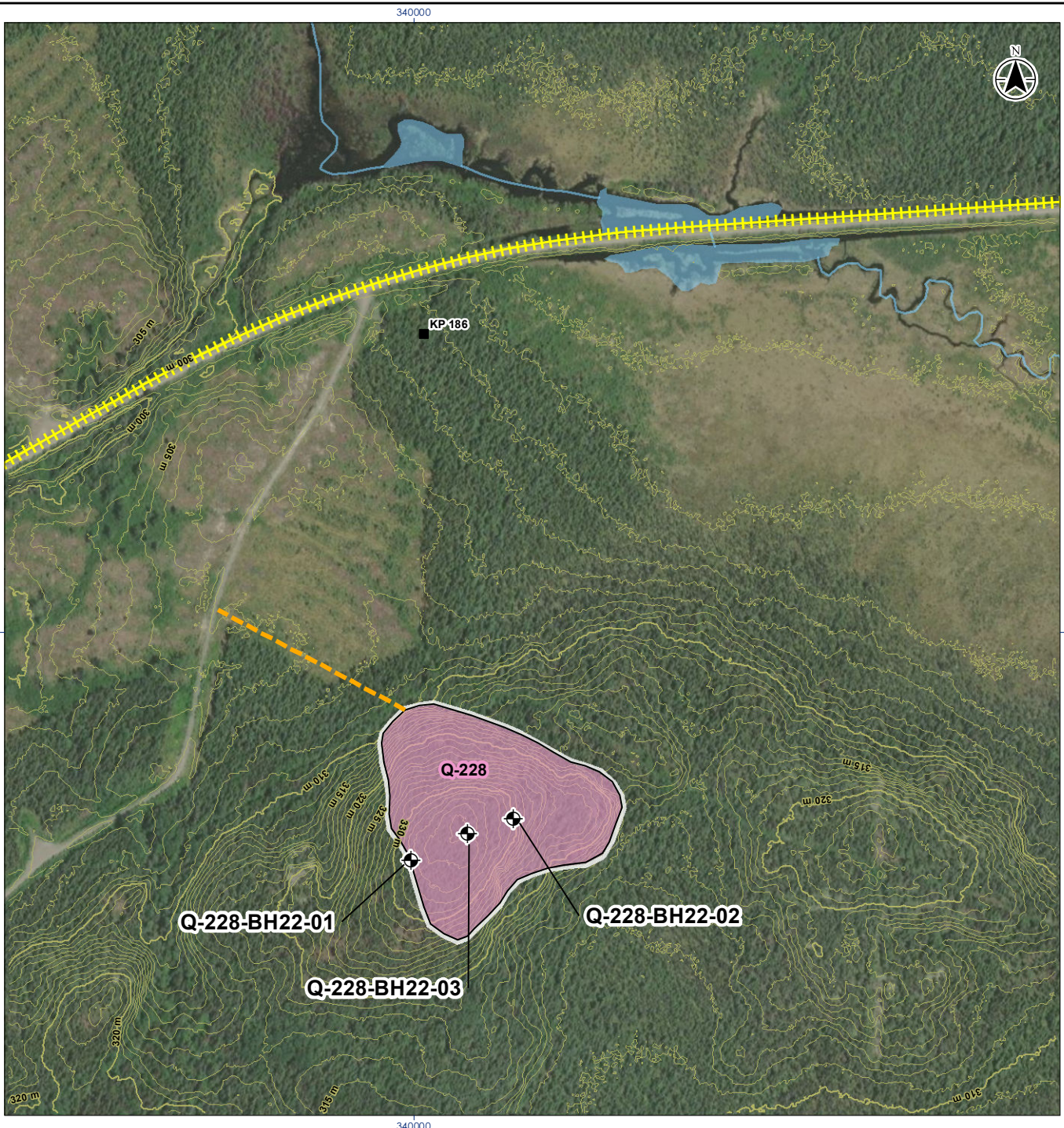
Map No. **B4**

Title: **Potential Quarry Site Q-190.9**

Notes
 1. Coordinate System: NAD 1983 CSRS MTM 9
 2. Geotechnical Investigation: Stantec, 2023
 3. Road Network: Adresses Québec, 2021
 4. Hydrography: GRHQ, 2017
 5. Topography: Forêt Ouverte, 2023
 6. Orthoimagery: ESRI-World Imagery, 2017

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 Revisé: 2023-02-21 By: brunette



- Projected Component**
- Potential Grevet-Chapais Railway Alignment
 - Proposed Access Road
 - Railway Kilometric Point (Systra, February 2023)

- Potential Material Source**
- Potential Quarry Site (Q)

- Geotechnical Investigation**
- ◆ Borehole

- Hydrography**
- Body of Water
 - Watercourse
- Topography**
- Contour line (1 m)
 - Primary
 - Secondary



Project Location: 158100425-C0008 REV A
 Eeyou Istchee, Québec
 Prepared by J. Brunette on 2023-02-21
 Technical Review by E. Ferland on 2023-02-21
 Independent Review by F. Vinet on 2023-02-21

Client/Project: Cree Development Corporation
 La Grande Alliance – Feasibility Study
 Phase 1

Map No. **B5**

Title: **Potential Quarry Site Q-228**

Notes

1. Coordinate System: NAD 1983 CSRS MTM 9
2. Geotechnical Investigation: Stantec, 2023
3. Road Network: Adresses Québec, 2021
4. Hydrography: GRHQ, 2017
5. Topography: Forêt Ouverte, 2023
6. Orthomogery: ESRI-World Imagery, 2017

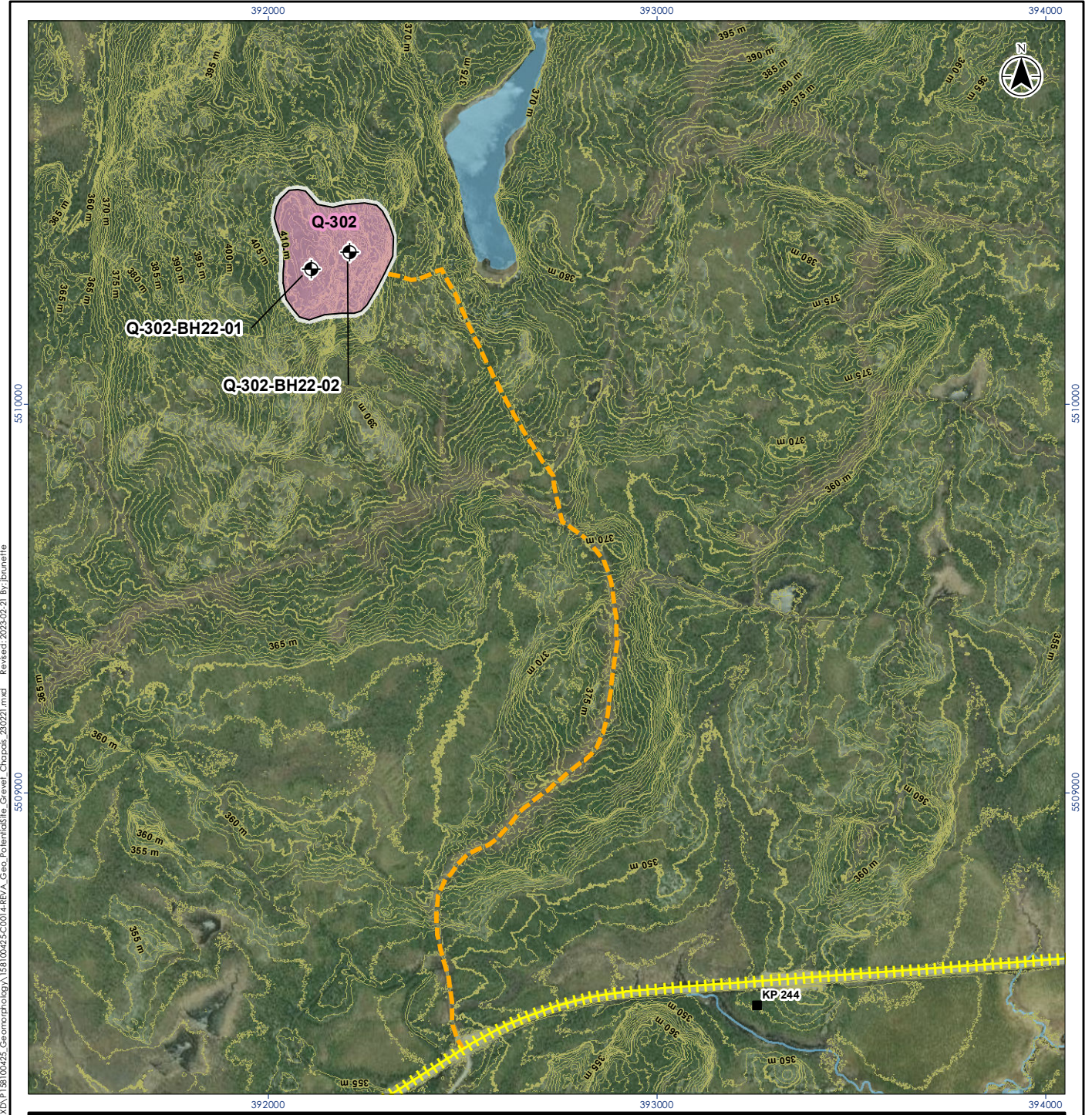
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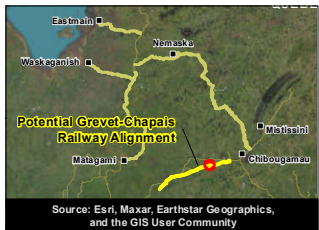
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Notes
1. Coordinate System: NAD 1983 CSRS MTM 9
2. Geotechnical Investigation: Stantec, 2023
3. Road Network: Adresses Québec, 2021
4. Hydrography: GRHQ, 2017
5. Topography: Forêt Ouverte, 2023
6. Orthoimagery: ESRI-World Imagery, 2017

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m
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- Projected Component**
 - Potential Grevet-Chapais Railway Alignment
 - Proposed Access Road
 - Railway Kilometric Point (Systra, February 2023)
- Potential Material Source**
 - Potential Quarry Site (Q)
- Geotechnical Investigation**
 - ⊕ Borehole

- Hydrography**
 - Body of Water
 - Watercourse
- Topography**
 - Contour line (1 m)
 - Primary
 - Secondary



Project Location 158100425-C008 REV A
Eeyou Istchee, Québec Prepared by J. Brunette on 2023-02-21
Technical Review by E. Ferland on 2023-02-21
Independent Review by F. Vinet on 2023-02-21

Client/Project
Cree Development Corporation
La Grande Alliance – Feasibility Study
Phase 1

Map No.
B6

Title
Potential Quarry Site Q-302

Appendix C Test Pit and Borehole Reports



Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : Geo System.: MTM-NAD83 Zone: 9 X : 293 095 Y : 5 457 800	Test Pit : GD-174-TP22-01 Page : 1 of 1 Start date : 2022-03-19 Inspector : M. Frigon, tech. Depth : 3,75 (m)
Project No.: 158100425.500.710.4	Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Walls : Plan :
Client: Cree Development Corporation		
Site: Grevet-Chapais Railway		

QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		MECHANIC CHARACTERISTICS OF SOILS			GROUNDWATER		
Clay	< 0.002 mm	Traces	< 10 %	COMPACTION	CONSISTENCY	Cu OR Su (kPa)		Date	Depth
Silt	0.002 - 0.08 mm	Some	10 - 20 %	Very loose	Very soft	< 12	Reading 1		(m)
Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Loose	Soft	12 - 25	Reading 2		(m)
Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %	Compact	Firm	25 - 50	Remarks :		
Cobbles	80 - 200 mm	Main word	Dominant fraction	Dense	Stiff	50 - 100			
Boulders	> 200 mm			Very dense	Very stiff	100 - 200			
				Hard	Hard	> 200			

STRATIGRAPHY				SAMPLES				TESTS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability fc : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _l	REMARKS
		0,00	TOPSOIL.									
		0,20	Native soil : Brown moist SAND and GRAVEL. - Presence of cobbles (15 %).			MA-01						
1		1,00	Brown to brown-grey moist GRAVEL and SAND with traces of silt. - Presence of cobbles (15 %).			MA-02						
5						MA-03						
2						MA-04						
3												
10												
3												
4		3,75	END OF TEST PIT									
4												
15												
5												



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 293 082 Y : 5 457 530 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9 Walls : Plan :	Test Pit : GD-174-TP22-02 Page : 1 of 1 Start date : 2022-03-19 Inspector : M. Frigon, tech. Depth : 0,25 (m)
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QUALITATIVE TERMINOLOGY Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	QUANTITATIVE TERMINOLOGY Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	MECHANIC CHARACTERISTICS OF SOILS COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	GROUNDWATER <table border="1"> <tr> <td></td> <td>Date</td> <td>Depth</td> </tr> <tr> <td>Reading 1</td> <td></td> <td>(m)</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </table> Remarks :		Date	Depth	Reading 1		(m)	Reading 2		(m)
	Date	Depth										
Reading 1		(m)										
Reading 2		(m)										

STRATIGRAPHY			SAMPLES				TESTS		REMARKS					
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)		WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded 		
		0,00	TOPSOIL.											
		0,25	END OF TEST PIT (Refusal on bedrock)											
1														
5														
2														
3		10												
4														
5		15												



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
------------------	--

Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 293 287 Y : 5 457 390 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-174-TP22-03 Page : 1 of 1 Start date : 2022-03-19 Inspector : M. Frigon, tech. Depth : 0,90 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS			GROUNDWATER		
Clay < 0.002 mm	Traces < 10 %	COMPACTION	CONSISTENCY	Cu OR Su (kPa)	Date	Depth	
Silt 0.002 - 0.08 mm	Some 10 - 20 %	Very loose	Very soft	< 12	Reading 1	(m)	
Sand 0.08 - 5 mm	Adjective (...y) 20 - 35 %	Loose	Soft	12 - 25	Reading 2	(m)	
Gravel 5 - 80 mm	and (ex: and gravel) > 35 %	Compact	Firm	25 - 50	Remarks :		
Cobbles 80 - 200 mm	Main word Dominant fraction	Dense	Stiff	50 - 100			
Boulders > 200 mm		Very dense	Very stiff	100 - 200			
			Hard	> 200			

STRATIGRAPHY				SAMPLES				TESTS						
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L	REMARKS		
		0.00	TOPSOIL. - Presence of roots.											
		0.25	Native soil : Brown moist SAND with traces of gravel and silt. - Presence of cobbles (30-35 %). - Traces of oxidation.			MA-01								
		0.90	END OF TEST PIT (Refusal on bedrock)											
1														
5														
2														
3														
10														
4														
15														
5														



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 293 243 Y : 5 457 170 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9 Walls : Plan :	Test Pit : GD-174-TP22-04 Page : 1 of 1 Start date : 2022-03-19 Inspector : M. Frigon, tech. Depth : 3,50 (m)
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QUALITATIVE TERMINOLOGY Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	QUANTITATIVE TERMINOLOGY Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	MECHANIC CHARACTERISTICS OF SOILS COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	GROUNDWATER <table border="1"> <tr> <td></td> <td>Date</td> <td>Depth</td> </tr> <tr> <td>Reading 1</td> <td></td> <td>(m)</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </table> Remarks :		Date	Depth	Reading 1		(m)	Reading 2		(m)
	Date	Depth										
Reading 1		(m)										
Reading 2		(m)										

STRATIGRAPHY			SAMPLES				TESTS		REMARKS			
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)		WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability fc : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _l
		0.00	TOPSOIL.									
		0.20	Native soil : Brown moist SAND and GRAVEL with traces of silt. - Presence of cobbles (15-20 %). - Traces of oxidation.			MA-01						
		0.70	Brown-grey moist GRAVEL with some sand. - Presence of cobbles (5-10 %).			MA-02						
		1.70	Grey moist SAND and GRAVEL with traces of silt. - Presence of cobbles (5 %) and boulders (1 %).			MA-03						
		3.50	END OF TEST PIT			MA-04						



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 293 579 Y : 5 457 190 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-174-TP22-05 Page : 1 of 1 Start date : 2022-03-19 Inspector : M. Frigon, tech. Depth : 0,20 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	QUANTITATIVE TERMINOLOGY Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	MECHANIC CHARACTERISTICS OF SOILS COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	GROUNDWATER <table border="1"> <tr> <td></td> <td>Date</td> <td>Depth</td> </tr> <tr> <td>Reading 1</td> <td></td> <td>(m)</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </table> Remarks :		Date	Depth	Reading 1		(m)	Reading 2		(m)
	Date	Depth										
Reading 1		(m)										
Reading 2		(m)										

STRATIGRAPHY			SAMPLES				TESTS		REMARKS					
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)		WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _l		
		0,00	TOPSOIL.											
		0,20	- Presence of roots. END OF TEST PIT (Refusal on bedrock)											
1														
5														
2														
3		10												
4														
5		15												



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 293 775 Y : 5 457 370 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-174-TP22-06 Page : 1 of 1 Start date : 2022-03-18 Inspector : M. Frigon, tech. Depth : 4,00 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS	GROUNDWATER									
Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	<table border="1"> <thead> <tr> <th>Reading 1</th> <th>Date</th> <th>Depth (m)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> Remarks :	Reading 1	Date	Depth (m)						
Reading 1	Date	Depth (m)										

STRATIGRAPHY				SAMPLES				TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW		GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L
		0,00	Fill : Mix of TOPSOIL and brown frozen SAND and GRAVEL. - Presence of cobbles.									
		1,30	Native soil : Brown-grey moist SAND with traces of gravel and silt. - Presence of cobbles (1-2 %).									
		4,00	END OF TEST PIT									

General remarks:	Verified by :
	F. Vinet, géo. M. Sc.
	Date : 2023-01-23

Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : Geo System.: MTM-NAD83 Zone: 9 X : 293 800 Y : 5 457 080	Test Pit : GD-174-TP22-07 Page : 1 of 1 Start date : 2022-03-19 Inspector : M. Frigon, tech.
Project No.: 158100425.500.710.4	Type : Test Pit	
Client: Cree Development Corporation	Equipment : Mechanical shovel	
Site: Grevet-Chapais Railway	Width : 1,0 (m) Length : 4,0 (m)	Walls : Plan :

QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		MECHANIC CHARACTERISTICS OF SOILS			GROUNDWATER		
Clay	< 0.002 mm	Traces	< 10 %	COMPACTION	CONSISTENCY	Cu OR Su (kPa)		Date	Depth
Silt	0.002 - 0.08 mm	Some	10 - 20 %	Very loose	Very soft	< 12	Reading 1		(m)
Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Loose	Soft	12 - 25	Reading 2		(m)
Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %	Compact	Firm	25 - 50	Remarks :		
Cobbles	80 - 200 mm	Main word	Dominant fraction	Dense	Stiff	50 - 100			
Boulders	> 200 mm			Very dense	Very stiff	100 - 200			
				Hard	Hard	> 200			

STRATIGRAPHY				SAMPLES				TESTS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability fc : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _l	REMARKS
		0.00	TOPSOIL.									
		0.15	Native soil : Brown frozen to moist SAND and GRAVEL with traces of silt. - Presence of cobbles (30-35 %).			MA-01						
1		1.00	Brown moist SAND and GRAVEL with traces of silt.			MA-02						
5		2.30	Grey moist SAND with traces of silt.			MA-03				GA		
2						MA-04						
3	10	4.00	END OF TEST PIT									
4												
15												
5												



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 294 201 Y : 5 456 790 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-174-TP22-08 Page : 1 of 1 Start date : 2022-03-18 Inspector : M. Frigon, tech. Depth : 3,70 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway		Walls : Plan :	

QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		MECHANIC CHARACTERISTICS OF SOILS			GROUNDWATER		
Clay	< 0.002 mm	Traces	< 10 %	COMPACTION	CONSISTENCY	Cu OR Su (kPa)		Date	Depth
Silt	0.002 - 0.08 mm	Some	10 - 20 %	Very loose	Very soft	< 12		Reading 1	(m)
Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Loose	Soft	12 - 25		Reading 2	(m)
Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %	Compact	Firm	25 - 50			
Cobbles	80 - 200 mm	Main word	Dominant fraction	Dense	Stiff	50 - 100		Remarks :	
Boulders	> 200 mm			Very dense	Very stiff	100 - 200			
				Hard	Hard	> 200			

STRATIGRAPHY				SAMPLES				TESTS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	REMARKS	REMARKS
		0,00	TOPSOIL.									
		0,20	Native soil: Brown to grey moist SAND and GRAVEL with traces of silt. - Presence of cobbles (15 %). - Traces of oxidation between depth of 0,20 and 1,00 m.			MA-01						
		5				MA-02						
		10				MA-03						
		15				MA-04						
		3,70	END OF TEST PIT									



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : Geo System.: MTM-NAD83 Zone: 9 X : 294 536 Y : 5 457 090	Test Pit : GD-174-TP22-09 Page : 1 of 1 Start date : 2022-03-18 Inspector : M. Frigon, tech.
Project No.: 158100425.500.710.4	Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Walls : Plan :
Client: Cree Development Corporation		Depth : 4,00 (m)
Site: Grevet-Chapais Railway		

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS	GROUNDWATER									
Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	COMPACTION Very loose Loose Compact Dense Very dense CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	<table border="1"> <thead> <tr> <th>Reading 1</th> <th>Date</th> <th>Depth (m)</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </tbody> </table>	Reading 1	Date	Depth (m)				Reading 2		(m)
Reading 1	Date	Depth (m)										
Reading 2		(m)										
Remarks :												

STRATIGRAPHY				SAMPLES				TESTS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L	REMARKS
		0.00	TOPSOIL.									
		0.20	Native soil : Brown frozen to moist SAND and GRAVEL with traces of silt. - Presence of cobbles (40-45 %). - Traces of oxidation.			MA-01						
1		1.00	Grey moist SAND with some silt and traces of gravel.			MA-02				GA		
2		2.00	Grey moist SAND with traces of silt.			MA-03						
3		3.00				MA-04				GA		
4		4.00	END OF TEST PIT									
5		5.00										



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 294 661 Y : 5 456 890 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9 Walls : Plan :	Test Pit : GD-174-TP22-10 Page : 1 of 1 Start date : 2022-03-18 Inspector : M. Frigon, tech. Depth : 3,70 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS	GROUNDWATER									
Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	<table border="1"> <thead> <tr> <th>Reading 1</th> <th>Date</th> <th>Depth (m)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Reading 2</td> <td> </td> <td>(m)</td> </tr> </tbody> </table> Remarks :	Reading 1	Date	Depth (m)				Reading 2		(m)
Reading 1	Date	Depth (m)										
Reading 2		(m)										

STRATIGRAPHY				SAMPLES				TESTS			
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability fc : compressive str. OM : organic matter CA : chemical analyses	REMARKS
0,00		0,05	TOPSOIL. Native soil : Grey moist SAND with traces of silt.			MA-01					
1		5				MA-02					
2		1,70	Grey moist Gravelly SAND with traces of silt. - Presence of cobbles (5-10 %).			MA-03				GA	
3		2,70	Grey moist SAND.			MA-04					
4		3,70	END OF TEST PIT								



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 331 721 Y : 5 491 030 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-222.2-TP22-01 Page : 1 of 1 Start date : 2022-03-21 Inspector : M. Frigon, tech. Depth : 4,00 (m)
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QUALITATIVE TERMINOLOGY Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	QUANTITATIVE TERMINOLOGY Traces < 10 % Some 10 - 20 % Adjective (...y) and (ex: and gravel) 20 - 35 % Main word > 35 % Dominant fraction	MECHANIC CHARACTERISTICS OF SOILS COMPACTION Very loose Loose Compact Dense Very dense CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	GROUNDWATER <table border="1"> <tr> <td></td> <td>Date</td> <td>Depth</td> </tr> <tr> <td>Reading 1</td> <td></td> <td>(m)</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </table> Remarks :		Date	Depth	Reading 1		(m)	Reading 2		(m)
	Date	Depth										
Reading 1		(m)										
Reading 2		(m)										

STRATIGRAPHY			SAMPLES				TESTS		REMARKS			
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)		WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L
		0.00	TOPSOIL. - Presence of roots and lichen.									
		0.20	Native soil : Brown-orange to grey moist SAND with traces of silt and gravel. - Traces of oxidation.			MA-01						
		1				MA-02						
		5				MA-03						
		2				MA-04						
		3										
		10										
		4										
		4.00	END OF TEST PIT									
		15										
		5										



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 332 099 Y : 5 490 930 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9 Walls : Plan :	Test Pit : GD-222.2-TP22-02 Page : 1 of 1 Start date : 2022-03-21 Inspector : M. Frigon, tech. Depth : 4,00 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		MECHANIC CHARACTERISTICS OF SOILS			GROUNDWATER		
Clay	< 0.002 mm	Traces	< 10 %	COMPACTION	CONSISTENCY	Cu OR Su (kPa)		Date	Depth
Silt	0.002 - 0.08 mm	Some	10 - 20 %	Very loose	Very soft	< 12		Reading 1	(m)
Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Loose	Soft	12 - 25		Reading 2	(m)
Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %	Compact	Firm	25 - 50		Remarks :	
Cobbles	80 - 200 mm	Main word	Dominant fraction	Dense	Stiff	50 - 100			
Boulders	> 200 mm			Very dense	Very stiff	100 - 200			
				Hard	Hard	> 200			

STRATIGRAPHY				SAMPLES				TESTS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability fc : compressive str. OM : organic matter CA : chemical analyses	REMARKS	REMARKS
		0,00	TOPSOIL.									
		0,10	- Presence of roots. Native soil : Brown-orange to grey moist SAND with traces of silt and gravel. - Traces of oxidation between depth of 0,10 to 0,30 m.									
1						MA-01						
5						MA-02						
2						MA-03						
3		10				MA-04						
4		4,00	END OF TEST PIT									
15												
5												



General remarks:	Verified by : F. Vinet, géo. M. Sc.
	Date : 2023-01-23

Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : Geo System.: MTM-NAD83 Zone: 9 X : 332 317 Y : 5 490 890	Test Pit : GD-222.2-TP22-03 Page : 1 of 1 Start date : 2022-03-21 Inspector : M. Frigon, tech.
Project No.: 158100425.500.710.4	Type : Test Pit	Depth : 4,00 (m)
Client: Cree Development Corporation	Equipment : Mechanical shovel	
Site: Grevet-Chapais Railway	Width : 1,0 (m) Length : 4,0 (m)	Walls : Plan :

QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		MECHANIC CHARACTERISTICS OF SOILS			GROUNDWATER		
Clay	< 0.002 mm	Traces	< 10 %	COMPACTION	CONSISTENCY	Cu OR Su (kPa)		Date	Depth
Silt	0.002 - 0.08 mm	Some	10 - 20 %	Very loose	Very soft	< 12		Reading 1	(m)
Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Loose	Soft	12 - 25		Reading 2	(m)
Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %	Compact	Firm	25 - 50		Remarks :	
Cobbles	80 - 200 mm	Main word	Dominant fraction	Dense	Stiff	50 - 100			
Boulders	> 200 mm			Very dense	Very stiff	100 - 200			
				Hard	Hard	> 200			

STRATIGRAPHY				SAMPLES				TESTS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W _L	REMARKS
		0.00	TOPSOIL.									
		0.15	Native soil : Brown-orange moist SAND with some silt and traces of gravel. - Traces of oxidation.			MA-01						
1		1.00	Grey moist SAND with some silt.			MA-02				GA		
2		2.00	Grey moist SAND with traces of gravel and silt. - Presence of cobbles (1-2 %).			MA-03						
3	10	3.00	Grey moist SAND with traces of silt.			MA-04				GA		
4		4.00	END OF TEST PIT									



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 332 550 Y : 5 491 300 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9 Walls : Plan :	Test Pit : GD-222.2-TP22-04 Page : 1 of 1 Start date : 2022-03-20 Inspector : M. Frigon, tech. Depth : 4,00 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS	GROUNDWATER									
Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	<table border="1"> <thead> <tr> <th>Reading 1</th> <th>Date</th> <th>Depth (m)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Reading 2</td> <td> </td> <td>(m)</td> </tr> </tbody> </table> Remarks :	Reading 1	Date	Depth (m)				Reading 2		(m)
Reading 1	Date	Depth (m)										
Reading 2		(m)										

STRATIGRAPHY				SAMPLES				TESTS		REMARKS	
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW		GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability fc : compressive str. OM : organic matter CA : chemical analyses
		0,00	TOPSOIL.								
		0,15	Native soil : Brown-orange to grey-brown moist SAND with traces of silt. - Traces of oxidation between a depth of 0,15 to 0,45 m.			MA-01					
		5				MA-02					
		10				MA-03					
		15				MA-04					
		4,00	END OF TEST PIT								



General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 332 860 Y : 5 491 530 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-222.2-TP22-05 Page : 1 of 1 Start date : 2022-03-20 Inspector : M. Frigon, tech. Depth : 4,00 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS	GROUNDWATER									
Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	<table border="1"> <thead> <tr> <th></th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>(m)</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </tbody> </table> Remarks :		Date	Depth	Reading 1		(m)	Reading 2		(m)
	Date	Depth										
Reading 1		(m)										
Reading 2		(m)										

STRATIGRAPHY				SAMPLES				TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW		GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W _L
		0,00	TOPSOIL.									
		0,10	- Presence of roots. Native soil : Brown moist Silty CLAY.			MA-01						
1		1,00	Brown to grey moist Silty CLAY with traces of sand.			MA-02						
5		1,50	Grey moist Silty SAND. - Presence of thin silt lamination.			MA-03						
2												
3												
10		3,50	Grey-brown moist SAND with some silt.			MA-04						
4		4,00	END OF TEST PIT			MA-05						
15												
5												



General remarks:	Verified by :
	F. Vinet, géo. M. Sc.
	Date : 2023-01-23

Project: La Grande Alliance - Feasibility Study - Phase I	Coordinate : X : 333 050 Y : 5 491 450 Type : Test Pit Equipment : Mechanical shovel Width : 1,0 (m) Length : 4,0 (m)	Geo System.: MTM-NAD83 Zone: 9	Test Pit : GD-222.2-TP22-06 Page : 1 of 1 Start date : 2022-03-20 Inspector : M. Frigon, tech. Depth : 4,00 (m)
Project No.: 158100425.500.710.4			
Client: Cree Development Corporation			
Site: Grevet-Chapais Railway			

QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	MECHANIC CHARACTERISTICS OF SOILS	GROUNDWATER									
Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	COMPACTION CONSISTENCY Cu OR Su (kPa) Very loose Very soft < 12 Loose Soft 12 - 25 Compact Firm 25 - 50 Dense Stiff 50 - 100 Very dense Very stiff 100 - 200 Hard > 200	<table border="1"> <thead> <tr> <th></th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>(m)</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>(m)</td> </tr> </tbody> </table> Remarks :		Date	Depth	Reading 1		(m)	Reading 2		(m)
	Date	Depth										
Reading 1		(m)										
Reading 2		(m)										

STRATIGRAPHY				SAMPLES				TESTS		REMARKS	
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	RECOVERY (%)	WATER LEVEL / WATER INFLOW		GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses ▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L
		0.00	TOPSOIL. - Presence of roots.								
		0.40	Native soil : Brown to grey moist to saturated SAND with some silt and traces of gravel.			MA-01					
		0.90	- Presence of organic matter. Brown to grey saturated Silty CLAY.			MA-02					
						MA-03					
		3.00	Grey saturated Clayey SILT with traces of sand.			MA-04					
		3.50	Grey saturated Silty SAND.			MA-05					
		4.00	END OF TEST PIT								

General remarks:	Verified by : F. Vinet, géo. M. Sc. Date : 2023-01-23
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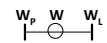
Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9 X : 306 476 Y : 5 470 050	Borehole : Q-190.9-BH22-01 Page : 1 of 2 Start date : 2022-11-08 Inspector : H. Desrochers, CPI Depth : 10,24 m
Project No.: 158100425.500.710.4	Type of borehole : Hollow Stem Auger + Diamond Core Equipment : CME 75 Sampling type : Corer : NQ Figure : 01	
Client: Cree Development Corporation		
Site: Grevet-Chapais Railway		

SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER									
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <thead> <tr> <th>Reading 1</th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>m</td> </tr> </tbody> </table>	Reading 1	Date	Depth			m	Reading 2		m
Reading 1	Date	Depth											
		m											
Reading 2		m											
				Remarks :									

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION INDEX "N" Very loose 0 - 4 Loose 4 - 10 Compact 10 - 30 Dense 30 - 50 Very dense > 50 CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	QUALIFICATIVE RQD Very poor < 25 % Poor 25 - 50 % Fair 50 - 75 % Good 75 - 90 % Excellent 90 - 100 %	Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm

STRATIGRAPHY			SAMPLES						TESTS		REMARKS			
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW	GA : grain size analysis H : hydrometer test C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f'c : compressive str. OM: organic matter CA : chemical analyses
		0.00	Bedrock : BASALT, of poor to excellent quality.											
		1				DC-01		NQ	100	33				
		5												
		2				DC-02		NQ	100	63		LA + MD (1.22 - 5.87 m)		
		3												
		10												
		4				DC-03		NQ	97	60				
		15												

General remarks:	Verified by : B. Cyr, géo. Date : 2023-01-23
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STRATIGRAPHY			SAMPLES					TESTS		REMARKS											
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)		N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW	GA : grain size analysis H : hydrometer test C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM: organic matter CA : chemical analyses	× : N (standard pen.) ▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded 						
6	20					DC-04		NQ	100	92											
7						DC-05		NQ	100	80											
8						DC-06		NQ	100	81											
9						DC-07		NQ	100	83											
10						DC-08		NQ	100	100											
		10,24	END OF BOREHOLE																		
11																					
12																					
13																					

Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9 X : 306 476 Y : 5 470 050	Borehole : Q-190.9-BH22-02 Page : 1 of 2 Start date : 2022-11-08 Inspector : H. Desrochers, CPI Depth : 10,67 m
Project No.: 158100425.500.710.4	Type of borehole : Hollow Stem Auger + Diamond Core Equipment : CME 75 Sampling type : Corer : NQ Figure : 01	
Client: Cree Development Corporation		
Site: Grevet-Chapais Railway		

SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER						
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <tr> <th>Date</th> <th>Depth</th> </tr> <tr> <td>Reading 1</td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td>m</td> </tr> </table> Remarks :	Date	Depth	Reading 1	m	Reading 2	m
Date	Depth									
Reading 1	m									
Reading 2	m									

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION INDEX "N" Very loose 0 - 4 Loose 4 - 10 Compact 10 - 30 Dense 30 - 50 Very dense > 50 CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	QUALIFICATIVE RQD Very poor < 25 % Poor 25 - 50 % Fair 50 - 75 % Good 75 - 90 % Excellent 90 - 100 %	Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm

STRATIGRAPHY			SAMPLES					WATER LEVEL / WATER INFLOW		TESTS		REMARKS	
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD	Standard penetration test BLOWS/150mm		WATER LEVEL / WATER INFLOW
		0.00	COBBLES and BOULDERS.				A	NQ	100				
1		0.93	Bedrock : BASALT, of very poor to excellent quality. - Traces of oxidation.				B						
2						DC-02		NQ	90	50		LA + MD (1.37 - 5.00 m)	
3						DC-03		NQ	100	19			
4						DC-04		NQ	100	69			
5						DC-05		NQ	100	56			

General remarks:	Verified by : Géo B. Cyr, géo. Date : 2023-01-23
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STRATIGRAPHY			SAMPLES							WATER LEVEL / WATER INFLOW		TESTS		REMARKS
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW	TESTS	
6	20						DC-06	NQ	100	43			LA + MD (5.00 - 9.83 m)	
7							DC-07	NQ	36	0				
8							DC-08	NQ	100	18				
9	30						DC-09	NQ	100	93				
10							DC-10	NQ	100	89				
11		10.67	END OF BOREHOLE											
12	40													
13														

Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9	Borehole : Q-228-BH22-01
Project No.: 158100425.500.710.4	X : 339 997	Page : 1 of 2
Client: Cree Development Corporation	Y : 5 488 810	Start date : 2022-08-22
Site: Grevet-Chapais Railway	Type of borehole : Hollow Stem Auger + Diamond Core	Inspector : H. Desrochers, CPI
	Equipment : CME 75	Depth : 7,19 m
	Sampling type : B, N	
	Corer : NQ	Figure : 01



SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER									
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <thead> <tr> <th></th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>m</td> </tr> </tbody> </table>		Date	Depth	Reading 1		m	Reading 2		m
	Date	Depth											
Reading 1		m											
Reading 2		m											

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION INDEX "N" Very loose 0 - 4 Loose 4 - 10 Compact 10 - 30 Dense 30 - 50 Very dense > 50 CONSISTENCY Very soft < 12 Soft 12 - 25 Firm 25 - 50 Stiff 50 - 100 Very stiff 100 - 200 Hard > 200	QUALIFICATIVE RQD Very poor < 25 % Poor 25 - 50 % Fair 50 - 75 % Good 75 - 90 % Excellent 90 - 100 %	Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm

STRATIGRAPHY			SAMPLES						TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
		0.00	TOPSOIL.				A						
		0,10	Native soil : Brown to brown-grey moist SAND with some to traces of silt and traces of gravel, loose to compact.			SS-01	B	N	0	0	3-3-4-5		
1						SS-02		B	54	22	4-5-17-17		
		5				SS-03		B	82	R	16-27-50 /13 cm		
2		1,98	Till deposit : Brown moist SAND with some silt, very dense. - Presence of boulders.			SS-04		B	75	R	16-62-50 /10 cm		
3		10											
4													
		15											

General remarks:

Verified by: B. Cyr, géo. #786
Date: 2023-02-21

STRATIGRAPHY			SAMPLES						TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
		5,61	Bedrock : Grey altered BASALT, of very poor quality.			DC-05	NQ	100	0				
		7,19	END OF BOREHOLE			DC-06	NQ	84	0				

Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9	Borehole : Q-228-BH22-02
Project No.: 158100425.500.710.4	X : 340 084	Page : 1 of 2
Client: Cree Development Corporation	Y : 5 488 840	Start date : 2022-08-25
Site: Grevet-Chapais Railway	Type of borehole : Hollow Stem Auger + Diamond Core	Inspector : H. Desrochers, CPI
	Equipment : CME 75	Depth : 10,16 m
	Sampling type : N	
	Corer : NQ	Figure : 01

SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER									
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <thead> <tr> <th></th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>m</td> </tr> </tbody> </table>		Date	Depth	Reading 1		m	Reading 2		m
	Date	Depth											
Reading 1		m											
Reading 2		m											

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION INDEX "N" Very loose 0 - 4 Loose 4 - 10 Compact 10 - 30 Dense 30 - 50 Very dense > 50	CONSISTENCY Very soft < 12 Soft 12 - 25 Firm 25 - 50 Stiff 50 - 100 Very stiff 100 - 200 Hard > 200	QUALIFICATIVE RQD Very poor < 25 % Poor 25 - 50 % Fair 50 - 75 % Good 75 - 90 % Excellent 90 - 100 %

STRATIGRAPHY			SAMPLES						TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
		0.00	TOPSOIL.										
		0.08	Native soil :			SS-01	A	N	100	R	1-1-50 /5 cm		
		0.23	Brown moist SAND with some silt and gravel.				B						
			Bedrock :			DC-02		NQ	95	11		LA + MD (0.23 - 5.90 m)	
			Grey and white massive BASALT, of very poor to good quality.			DC-03		NQ	100	77			
						DC-04		NQ	100	87			

General remarks: _____

Verified by: **B. Cyr, géo.**

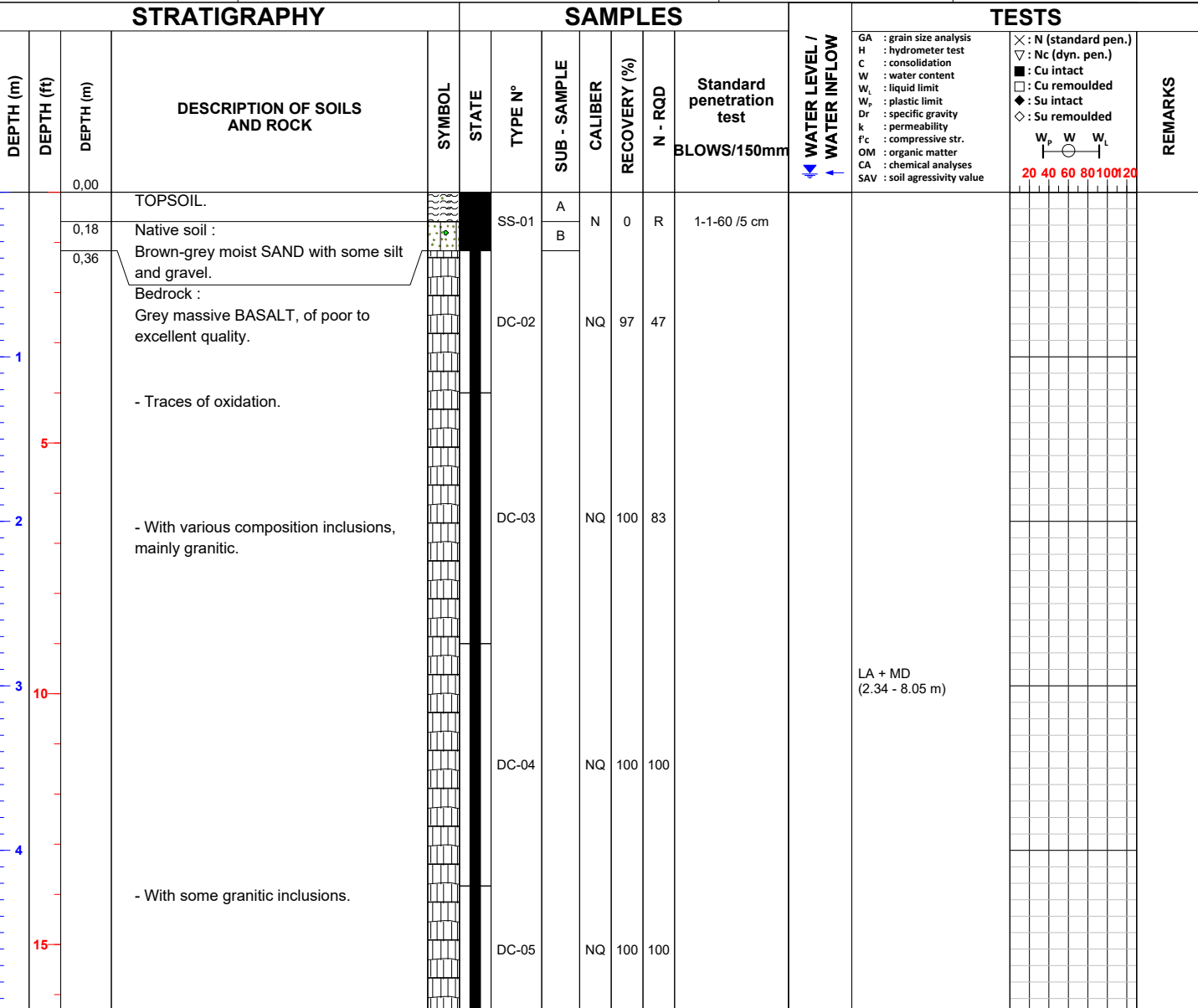
Date: **2023-02-21**

STRATIGRAPHY			SAMPLES					TESTS		REMARKS			
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)		N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
6	20					DC-05		NQ	100	53			
7						DC-06		NQ	100	95		LA + MD (5.89 - 10.16 m)	
8						DC-07		NQ	100	73			
9	30					DC-08		NQ	100	81			
10		10,16	END OF BOREHOLE										
11	35												
12	40												
13													

Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9	Borehole : Q-228-BH22-03
Project No.: 158100425.500.710.4	X : 340 045	Page : 1 of 2
Client: Cree Development Corporation	Y : 5 488 830	Start date : 2022-08-26
Site: Grevet-Chapais Railway	Type of borehole : Hollow Stem Auger + Diamond Core	Inspector : H. Desrochers, CPI
	Equipment : CME 75	Depth : 8,05 m
	Sampling type : N	
	Corer : NQ	Figure : 01

SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER									
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <thead> <tr> <th></th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>m</td> </tr> </tbody> </table>		Date	Depth	Reading 1		m	Reading 2		m
	Date	Depth											
Reading 1		m											
Reading 2		m											

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION Very loose Loose Compact Dense Very dense INDEX "N" 0 - 4 4 - 10 10 - 30 30 - 50 > 50 CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	QUALIFICATIVE Very poor Poor Fair Good Excellent RQD < 25 % 25 - 50 % 50 - 75 % 75 - 90 % 90 - 100 %	JOINTS SPACING Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm



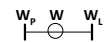
General remarks:

Verified by: Géo
 B. Cyr, géo.
 Date: 2023-02-21

STRATIGRAPHY				SAMPLES					WATER LEVEL / WATER INFLOW		TESTS		REMARKS	
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW		TESTS
6	20													
7							DC-06	NQ	100	63				
8							DC-07	NQ	100	100				
8		8.05	END OF BOREHOLE											
9	30													
10														
11	35													
12	40													
13														

GA : grain size analysis
 H : hydrometer test
 C : consolidation
 W : water content
 W_L : liquid limit
 W_p : plastic limit
 Dr : specific gravity
 k : permeability
 f_c : compressive str.
 OM : organic matter
 CA : chemical analyses
 SAV : soil aggressivity value

X : N (standard pen.)
 ▽ : Nc (dyn. pen.)
 ■ : Cu intact
 □ : Cu remoulded
 ◆ : Su intact
 ◇ : Su remoulded



20 40 60 80 100 120

Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9	Borehole : Q-302-BH22-01
Project No.: 158100425.500.710.4	X : 339 997	Page : 1 of 2
Client: Cree Development Corporation	Y : 5 488 810	Start date : 2022-08-27
Site: Grevet-Chapais Railway	Type of borehole : Hollow Stem Auger + Diamond Core	Inspector : H. Desrochers, CPI
	Equipment : CME 75	Depth : 10,79 m
	Sampling type :	
	Corer : NQ	Figure : 01

SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER									
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <thead> <tr> <th></th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>m</td> </tr> </tbody> </table>		Date	Depth	Reading 1		m	Reading 2		m
	Date	Depth											
Reading 1		m											
Reading 2		m											
				Remarks :									

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION INDEX "N" Very loose 0 - 4 Loose 4 - 10 Compact 10 - 30 Dense 30 - 50 Very dense > 50	CONSISTENCY Very soft < 12 Soft 12 - 25 Firm 25 - 50 Stiff 50 - 100 Very stiff 100 - 200 Hard > 200	QUALIFICATIVE RQD Very poor < 25 % Poor 25 - 50 % Fair 50 - 75 % Good 75 - 90 % Excellent 90 - 100 %
			JOINTS SPACING Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm

STRATIGRAPHY			SAMPLES						TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
		0.00	Native soil : Brown moist SAND with some gravel and traces of silt.										GA : grain size analysis H : hydrometer test C : consolidation W : water content W _L : liquid limit W _p : plastic limit D _r : specific gravity k : permeability F _c : compressive str. OM : organic matter CA : chemical analyses SAV : soil aggressivity value
		0.38	- Presence of cobbles. Bedrock : Grey to pink MIGMATITE, of poor to excellent quality.										X : N (standard pen.) ▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L
1					DC-01		NQ		100	89			
5					DC-02		NQ		97	87		LA + MD (1.07 - 5.69 m)	
10					DC-03		NQ		100	48			
15					DC-04		NQ		100	42			

General remarks: _____

Verified by: Géo
 B. Cyr, géo. #186
 Date : 2023-02-21

STRATIGRAPHY			SAMPLES						TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
6	20												
7							DC-05	NQ	100	82			
8							DC-06	NQ	100	78			
9	30						DC-07	NQ	100	100			
10							DC-08	NQ	100	100			
11		10,79	END OF BOREHOLE										
12	40												
13													

Project: La Grande Alliance - feasibility Study - Phase I	Coordinate : Geo. System : MTM-NAD83 Zone: 9 X : 392 209 Y : 5 510 390	Borehole : Q-302-BH22-02 Page : 1 of 2 Start date : 2022-08-28 Inspector : H. Desrochers, CPI Depth : 10,57 m
Project No.: 158100425.500.710.4	Type of borehole : Hollow Stem Auger + Diamond Core	
Client: Cree Development Corporation	Equipment : CME 75	
Site: Grevet-Chapais Railway	Sampling type : N	
	Corer : NQ	Figure : 01

SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER									
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...y) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<table border="1"> <thead> <tr> <th>Reading</th> <th>Date</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>Reading 1</td> <td></td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td></td> <td>m</td> </tr> </tbody> </table>	Reading	Date	Depth	Reading 1		m	Reading 2		m
Reading	Date	Depth											
Reading 1		m											
Reading 2		m											

SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS	ROCK QUALITY DESIGNATION	JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION INDEX "N" Very loose 0 - 4 Loose 4 - 10 Compact 10 - 30 Dense 30 - 50 Very dense > 50	QUALIFICATIVE RQD Very poor < 25 % Poor 25 - 50 % Fair 50 - 75 % Good 75 - 90 % Excellent 90 - 100 %	Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm

STRATIGRAPHY			SAMPLES					TESTS		REMARKS				
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)		N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW	GA : grain size analysis H : hydrometer test C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f'c : compressive str. OM: organic matter CA : chemical analyses
		0.00	TOPSOIL.		X	SS-01		N	75	R	1-5-50 /0 cm			
		0.30	Bedrock : Grey MIGMATITE, of fair to excellent quality.		X	DC-02		NQ	100	73			LA + MD (0.30 - 5.69 m)	
1					X	DC-03		NQ	100	100				
2					X	DC-04		NQ	100	31				
3		10			X	DC-05		NQ	100	97				
4					X									
		15			X									

General remarks:	Verified by : B. Cyr, géo. Date : 2023-01-23
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STRATIGRAPHY			SAMPLES						TESTS		REMARKS		
DEPTH (m)	DEPTH (ft)	DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD		Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW
6	20			~									
				~			DC-06	NQ	100	99			
7				~									
				~			DC-07	NQ	100	100			
8				~									
				~									
9				~			DC-08	NQ	100	97			
10				~									
				~									
				~			DC-09	NQ	100	93			
		10,57	END OF BOREHOLE										
11													
12													
13													

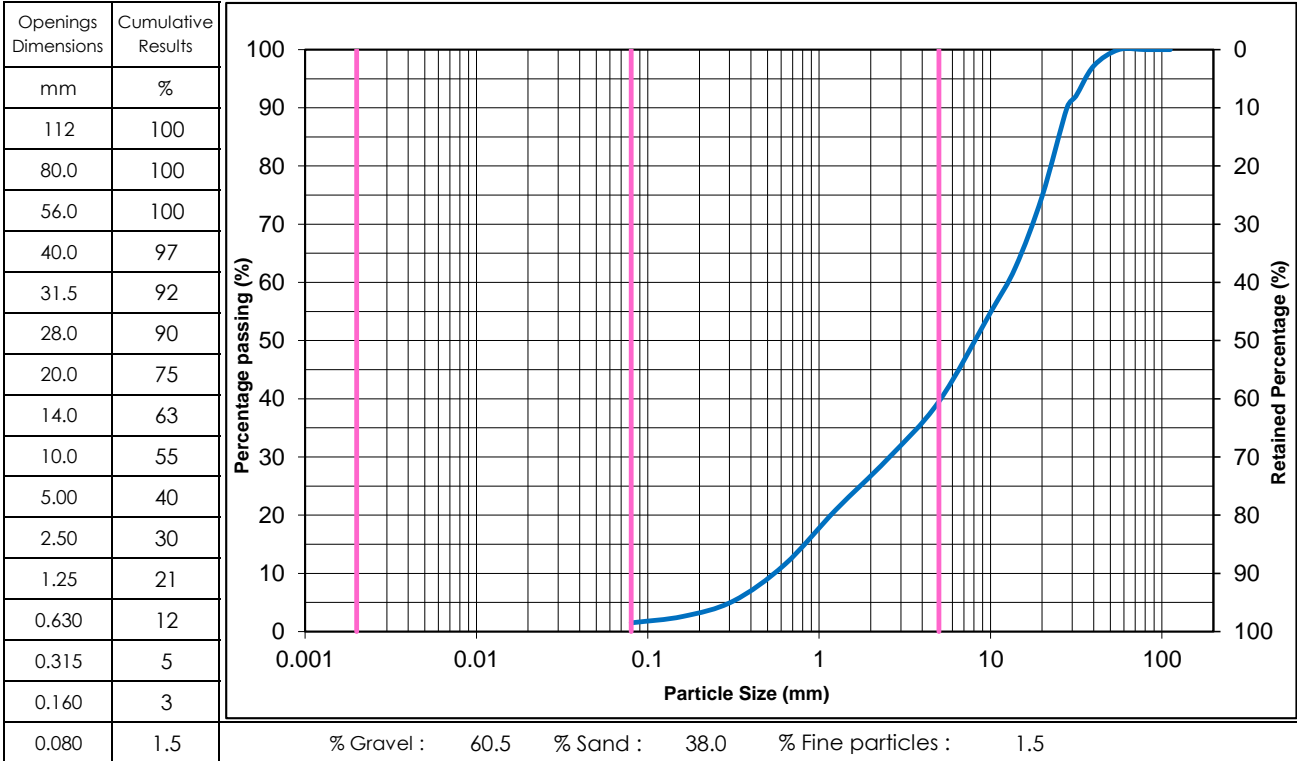
Appendix D Laboratory Test Results



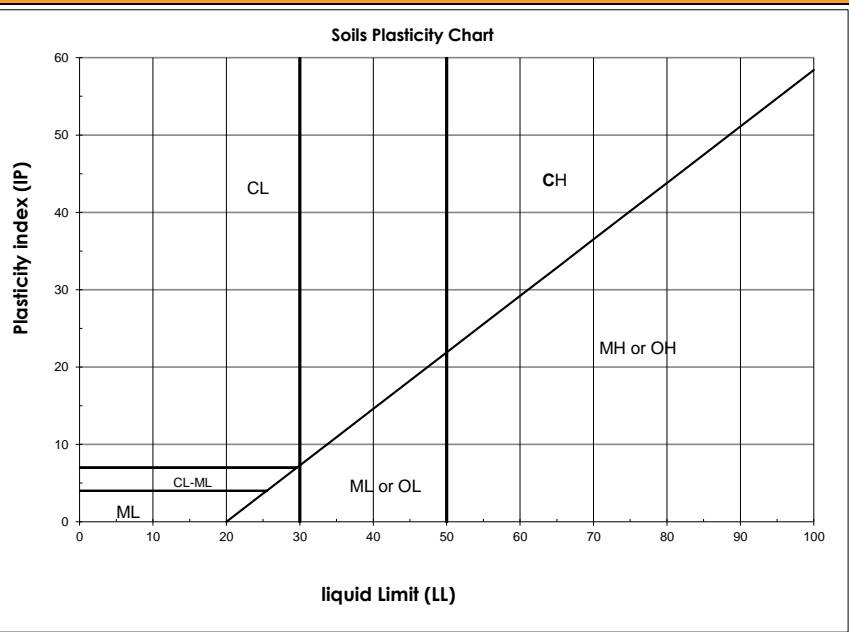
Client : Cree Developpement Corporation
 Project : La Grande Alliance - Feasibility Study - Phase I
 Grevet-Chapais Railway
 Project No : 158100425.500.710.4
 Sample No : GD-174-TP22-01 MA-03
 Depth : 2,0 - 3,0m

Sampled by : M. Frigon/ T. Coulaux
 Sampling Date : March 19, 2022

Material Description : Gravel and Sand, traces of fine particles

Grain Size Analysis (BNQ 2501-025)

Other tests

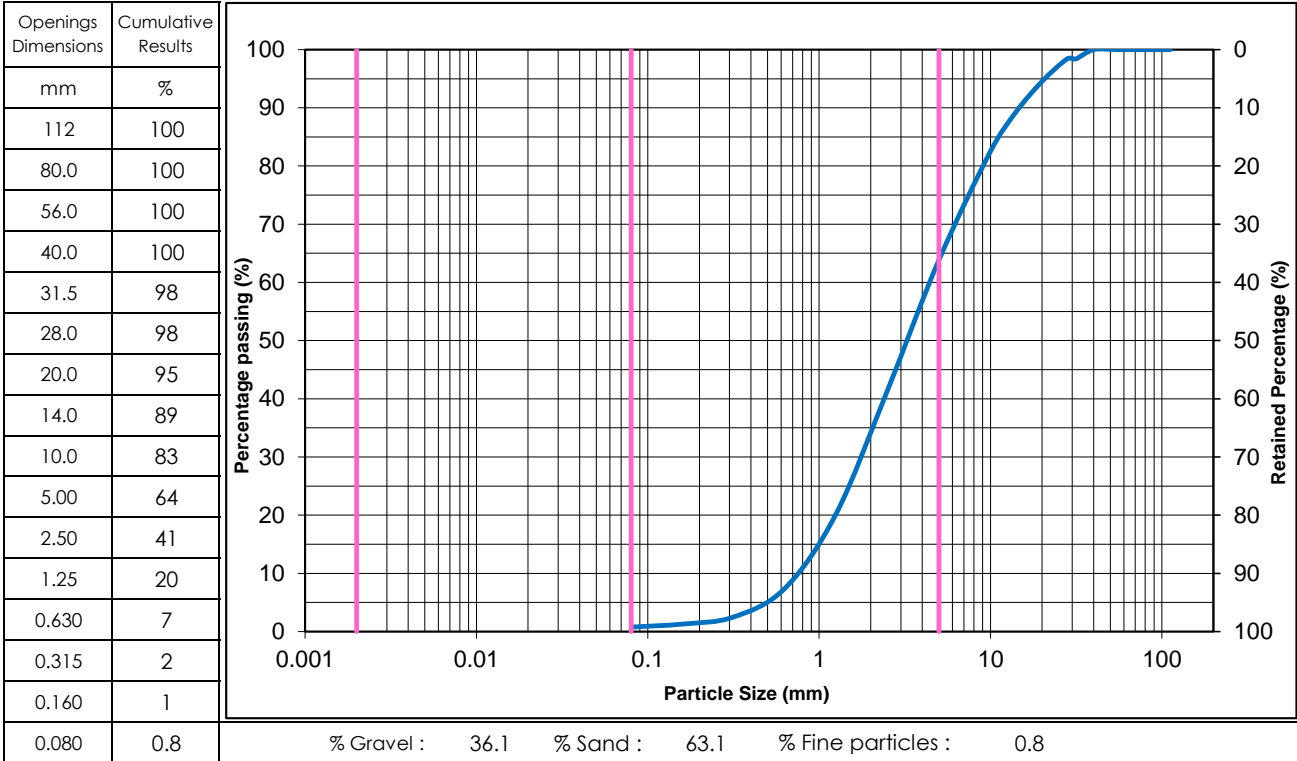
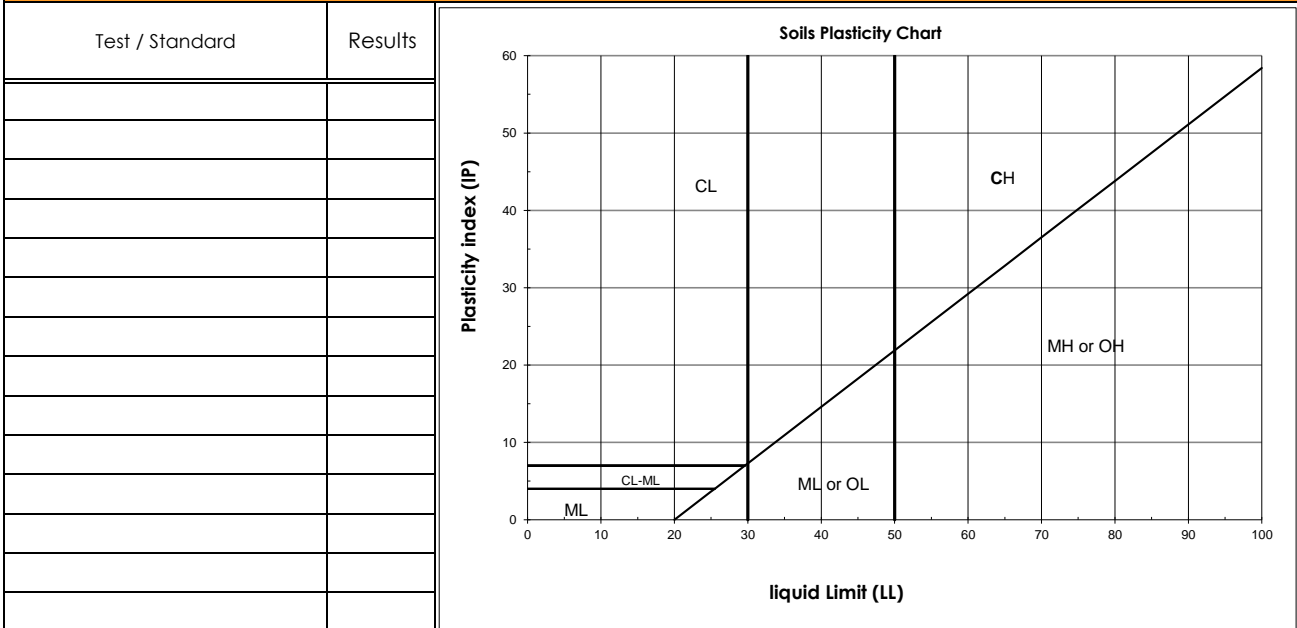
Test / Standard	Results


Remarks :

 Prepared by : Benoit Cyr, Geo. *Bj Cyr #786*

Date : May 27, 2022

Client :	Cree Developpement Corporation	Sampled by :	M. Frigon/ T. Coulaux
Project :	La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date :	March 19, 2022
Project No :	158100425.500.710.4	Material Description :	Sand and Gravel, traces of fine particles
Sample No :	GD-174-TP22-04 MA-03		
Depth :	1,7 - 2,7m		

Grain Size Analysis (BNQ 2501-025)

Other tests


Remarks :

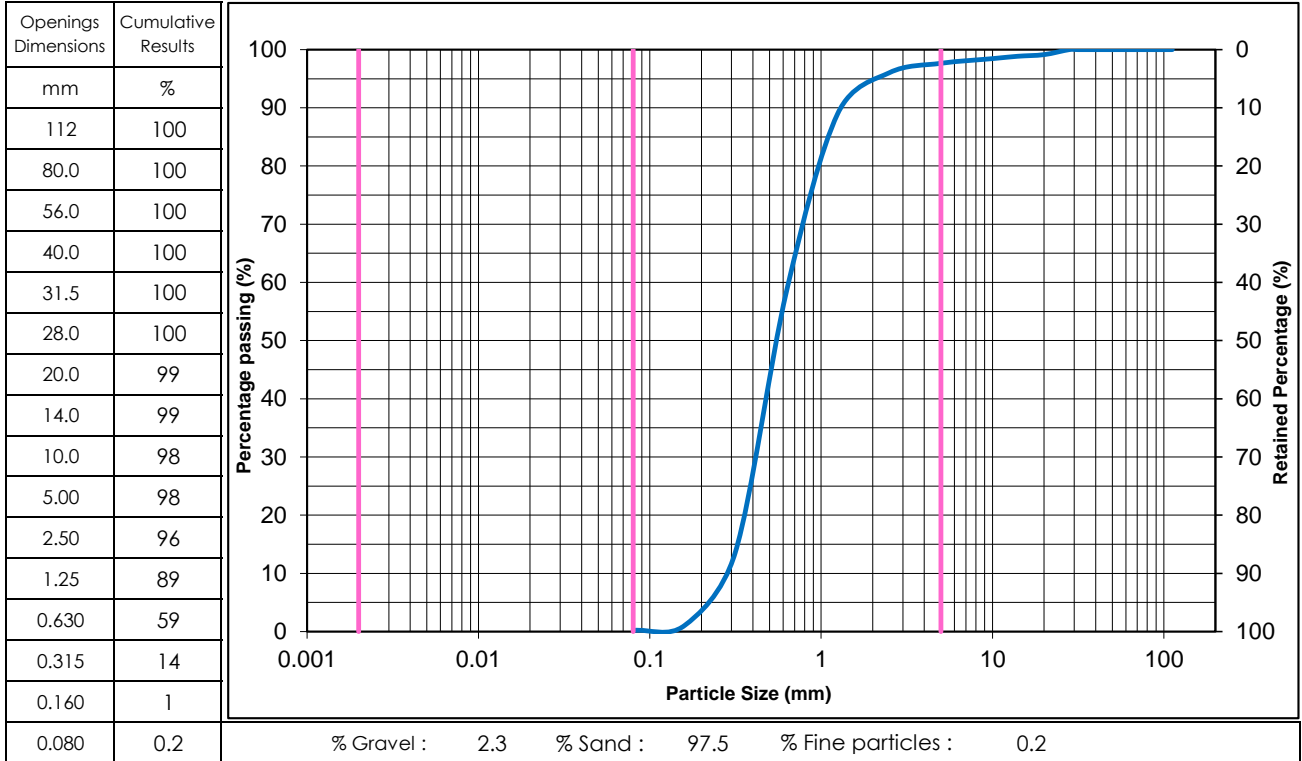
Prepared by :

 Benoit Cyr, Geo. *BJ*

Date : May 27, 2022

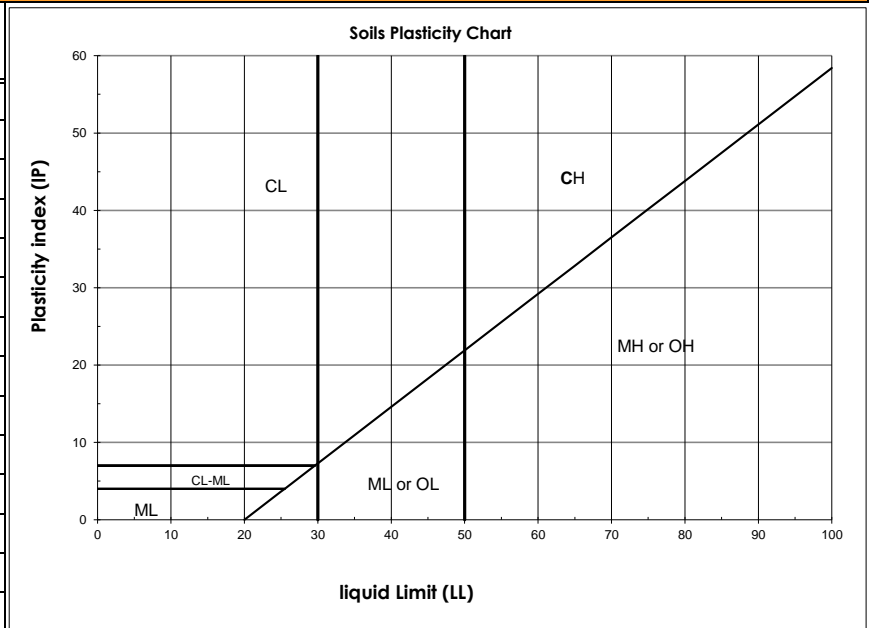
Client : Cree Developpement Corporation	Sampled by : M. Frigon/ T. Coulaux
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date : March 18, 2022
Project No : 158100425.500.710.4	Material Description : Sand, traces of Gravel, traces of fine particles
Sample No : GD-174-TP22-06 MA-04	
Depth : 2,3 - 3,3m	

Grain Size Analysis (BNQ 2501-025)



Other tests

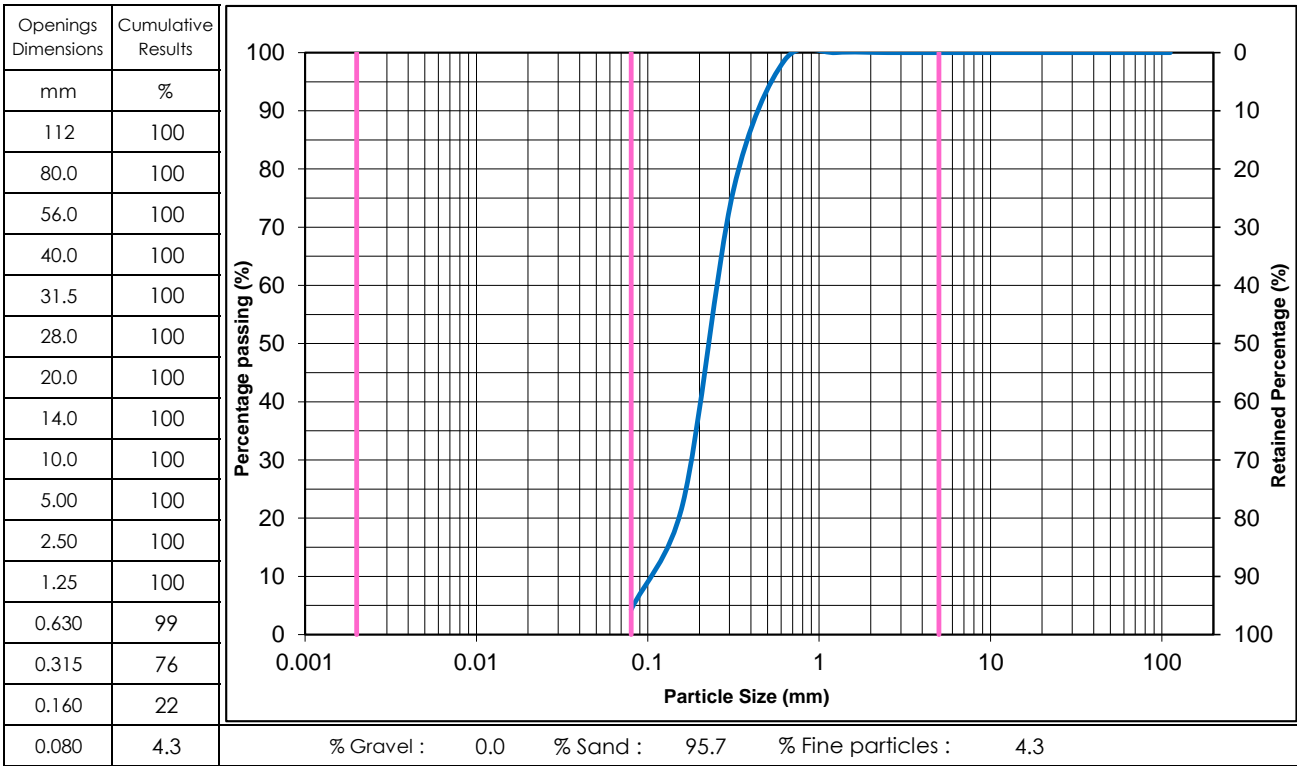
Test / Standard	Results



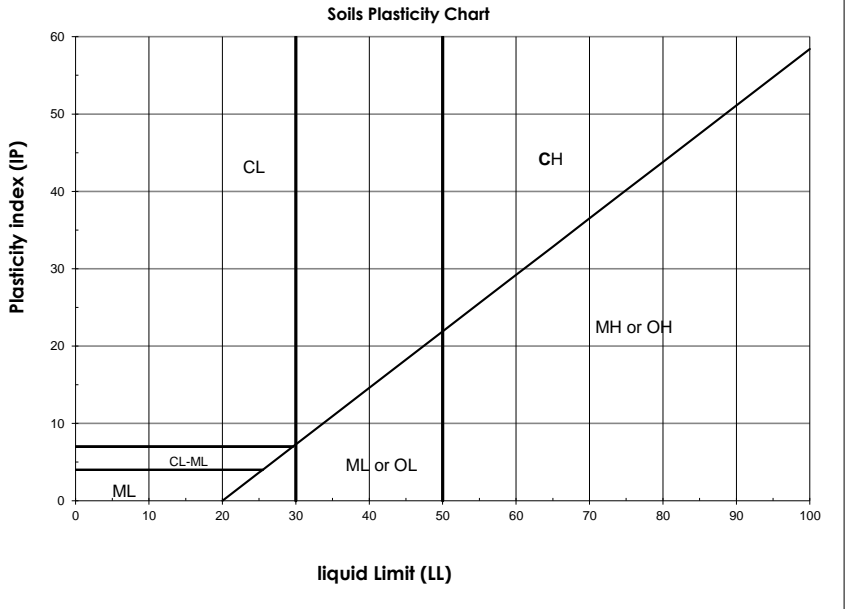
Remarks : _____

Prepared by : Benoit Cyr, Geo. *B.C. Geo. #786* **Date :** May 27, 2022

Client : Cree Developpement Corporation	Sampled by : M. Frigon/ T. Coulaux
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date : March 19, 2022
Project No : 158100425.500.710.4	
Sample No : GD-174-TP22-07 MA-03	Material Description : Sand, traces of fine particles
Depth : 2,3 - 3,0m	

Grain Size Analysis (BNQ 2501-025)

Other tests

Test / Standard	Results

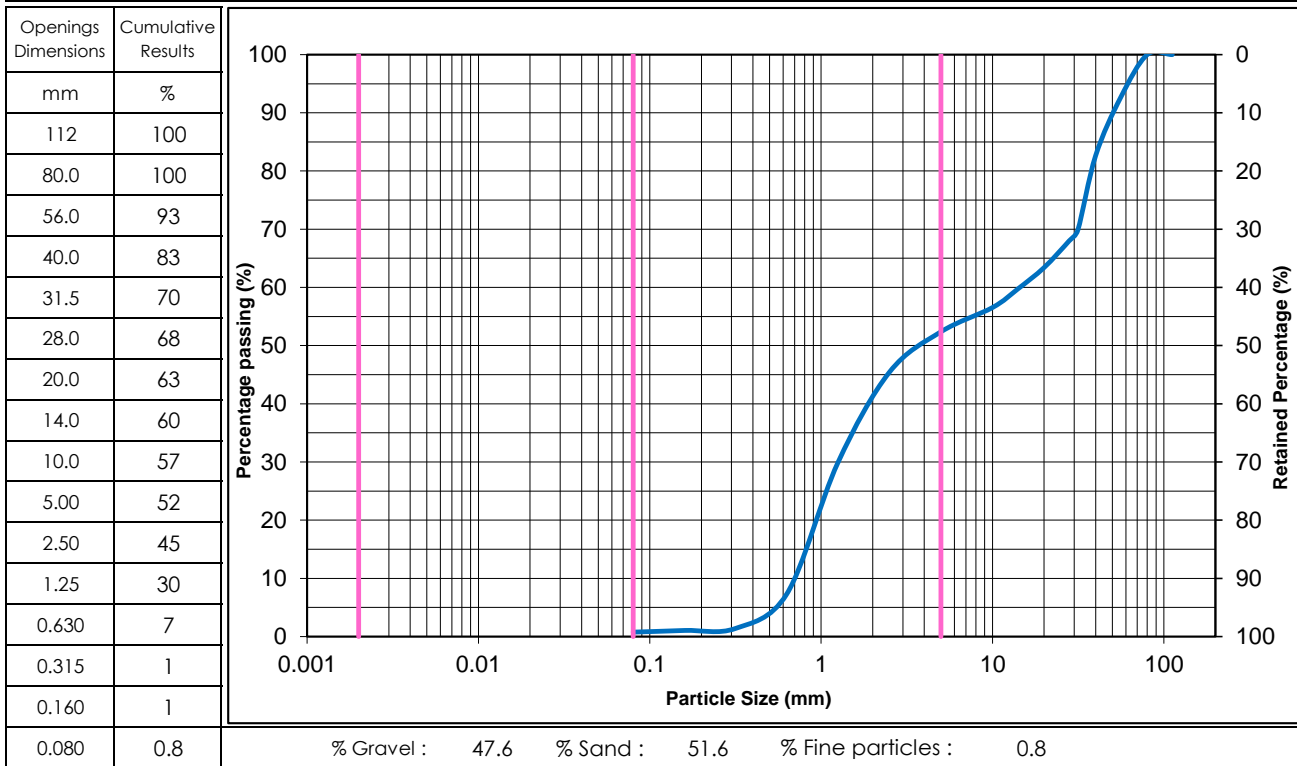

 Remarks :

 Prepared by : Benoit Cyr, Geo. *B.C.*
Geo. #186

 Date : May 27, 2022

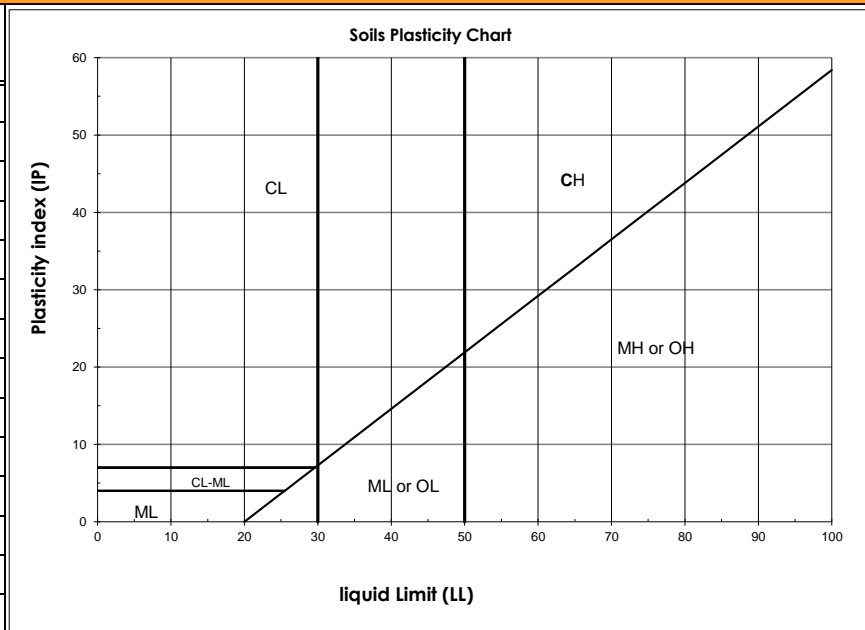
Client :	Cree Developpement Corporation	Sampled by :	M. Frigon/ T. Coulaux
Project :	La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date :	March 18, 2022
Project No :	158100425.500.710.4	Material Description :	Sand and Gravel, traces of fine particles
Sample No :	GD-174-TP22-08 MA-02		
Depth :	1,0 - 2,0m		

Grain Size Analysis (BNQ 2501-025)



Other tests

Test / Standard	Results



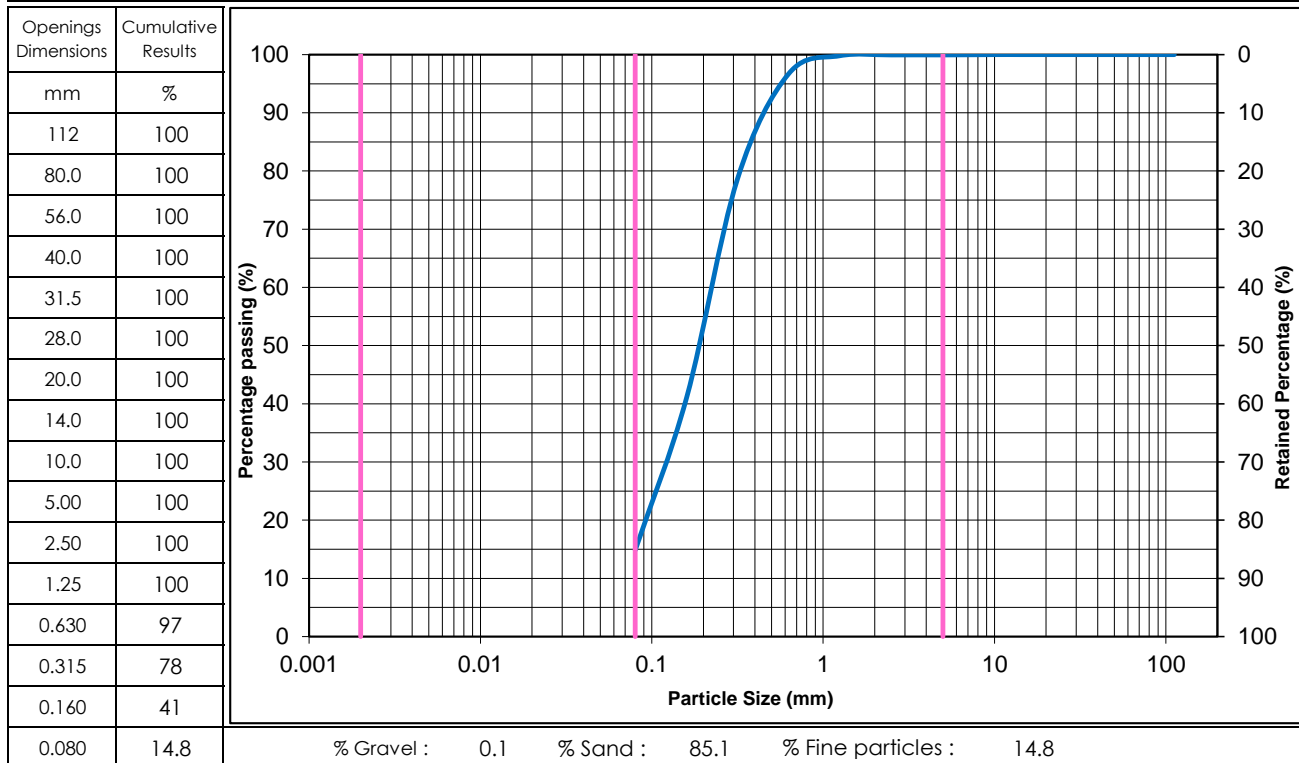
Remarks :

 Prepared by : Benoit Cyr, Geo. *BJ Geo #786*

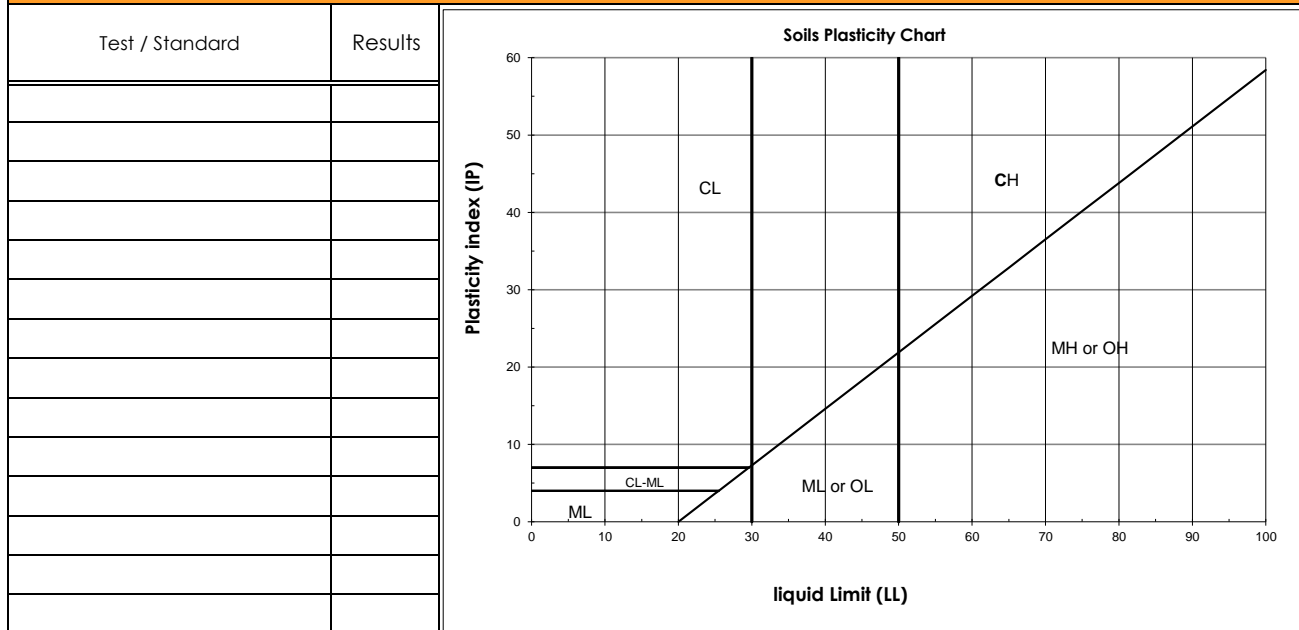
Date : May 27, 2022

Client : Cree Developpement Corporation	Sampled by : M. Frigon/ T. Coulaux
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date : March 18, 2022
Project No : 158100425.500.710.4	Material Description : Sand, some fine particles, traces of Gravel
Sample No : GD-174-TP22-09 MA-02	
Depth : 1,0 - 2,0m	

Grain Size Analysis (BNQ 2501-025)



Other tests

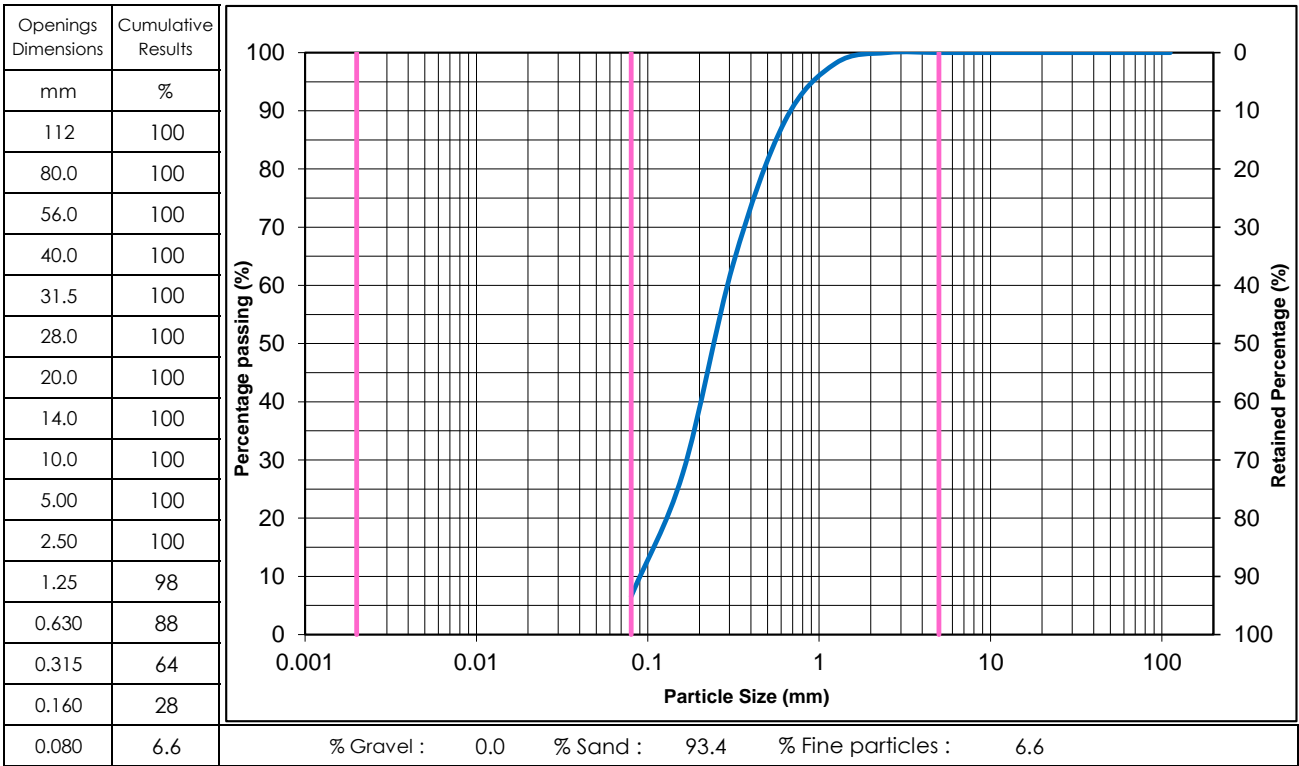


Remarks : _____

Prepared by : Benoit Cyr, Geo. *BJ* ^{.Geo} _{#386} **Date :** May 27, 2022

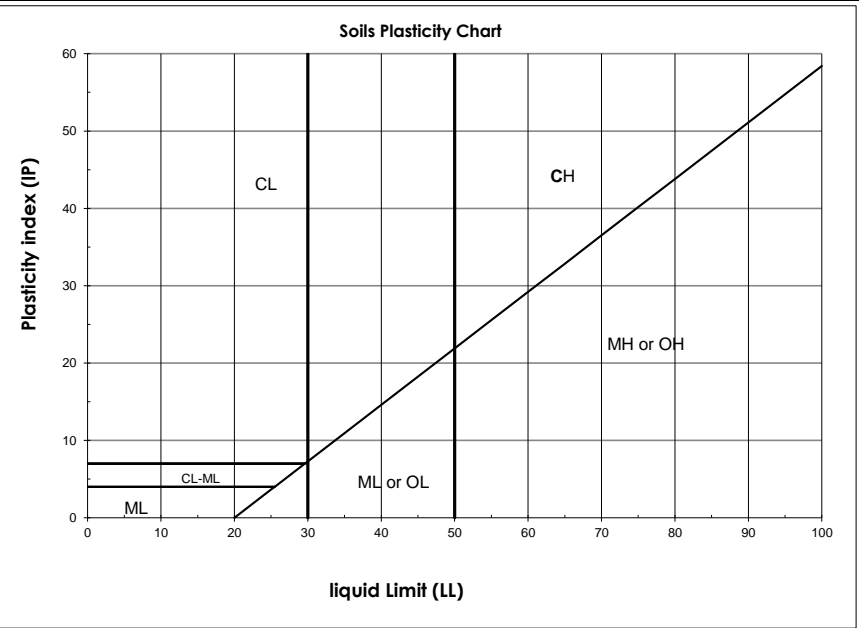
Client : Cree Developpement Corporation	Sampled by : M. Frigon/ T. Coulaux
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date : March 18, 2022
Project No : 158100425.500.710.4	
Sample No : GD-174-TP22-09 MA-04	Material Description : Sand, traces of fine particles
Depth : 3,0 - 4,0m	

Grain Size Analysis (BNQ 2501-025)




Other tests

Test / Standard	Results

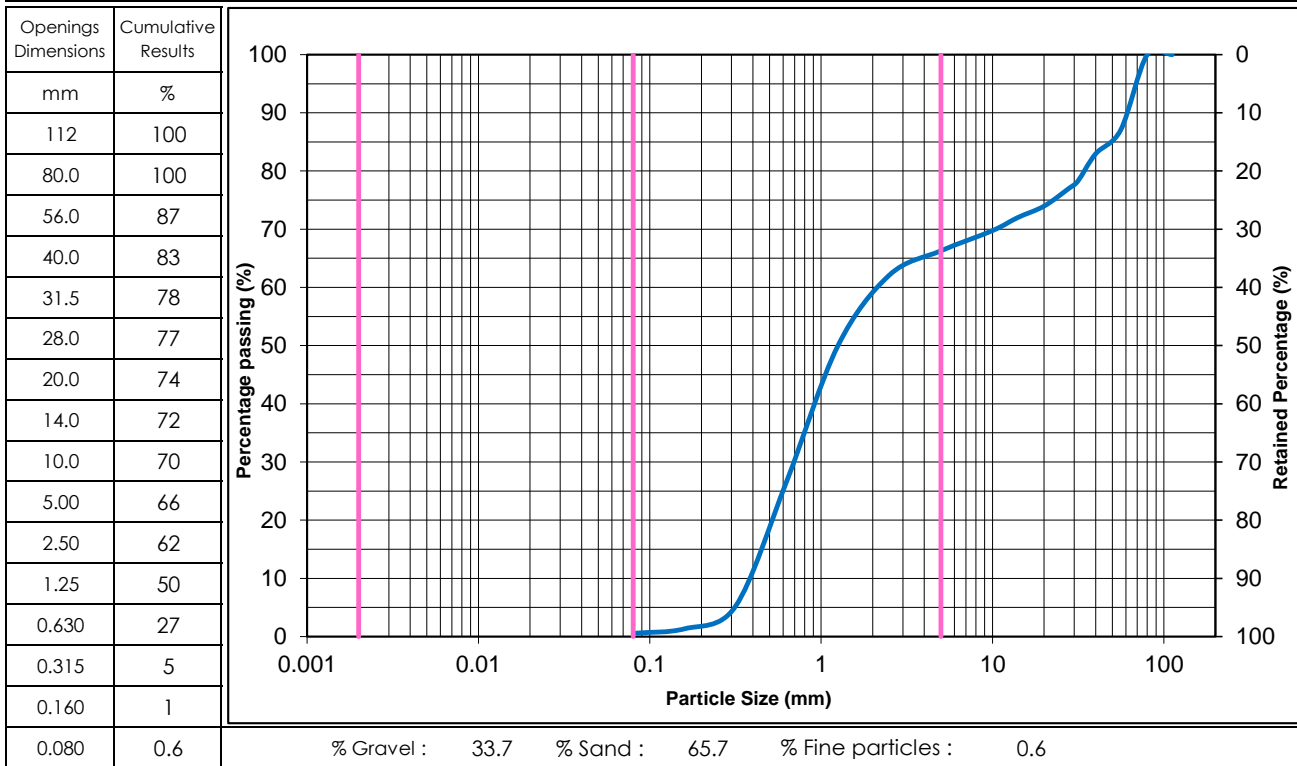


Remarks : _____

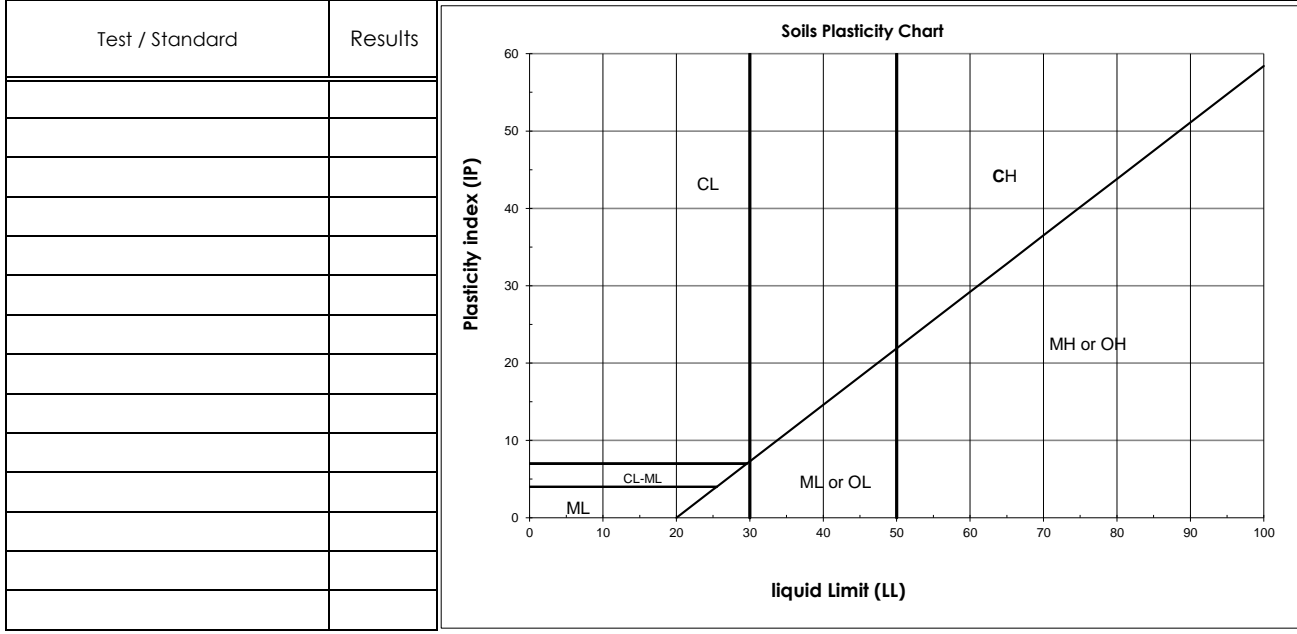
Prepared by : Benoit Cyr, Geo. 	Date : May 27, 2022
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Client : Cree Developpement Corporation	Sampled by : M. Frigon/ T. Coulaux
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date : March 18, 2022
Project No : 158100425.500.710.4	Material Description : Gravelly Sand, traces of fine particles
Sample No : GD-174-TP22-10 MA-03	
Depth : 1,7 - 2,7m	

Grain Size Analysis (BNQ 2501-025)



Other tests



Remarks :

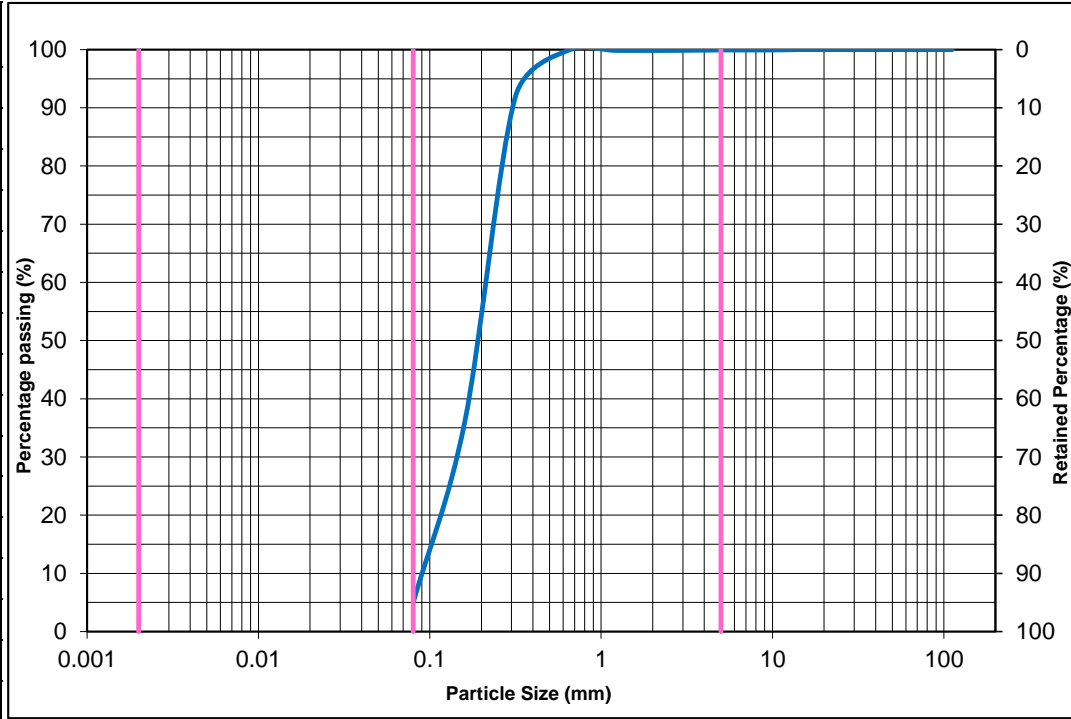
Prepared by : Benoit Cyr, Geo. *BJ* Date : May 27, 2022

Client : Cree Developpement Corporation
 Project : La Grande Alliance - Feasibility Study - Phase I
 Grevet-Chapais Railway
 Project No : 158100425.500.710.4
 Sample No : GD-222.2-TP22-01 MA-02
 Depth : 1,0 - 2,0m

Sampled by : M. Frigon/ T. Coulaux
 Sampling Date : March 21, 2022
 Material Description : Sand, traces of fine particles,
 traces of Gravel

Grain Size Analysis (BNQ 2501-025)

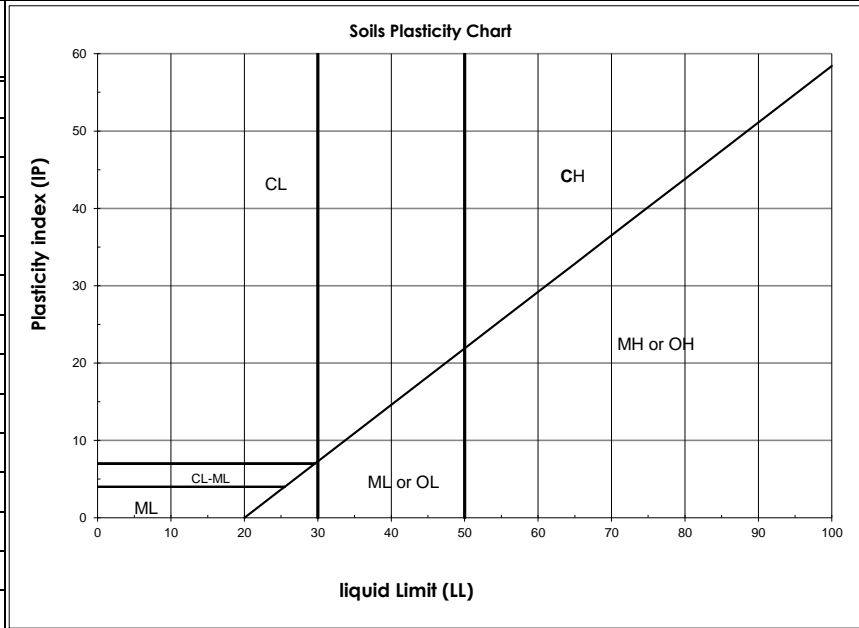
Openings Dimensions	Cumulative Results
mm	%
112	100
80.0	100
56.0	100
40.0	100
31.5	100
28.0	100
20.0	100
14.0	100
10.0	100
5.00	100
2.50	100
1.25	100
0.630	100
0.315	92
0.160	36
0.080	5.0



% Gravel : 0.1 % Sand : 94.9 % Fine particles : 5.0

Other tests

Test / Standard	Results



Remarks : _____

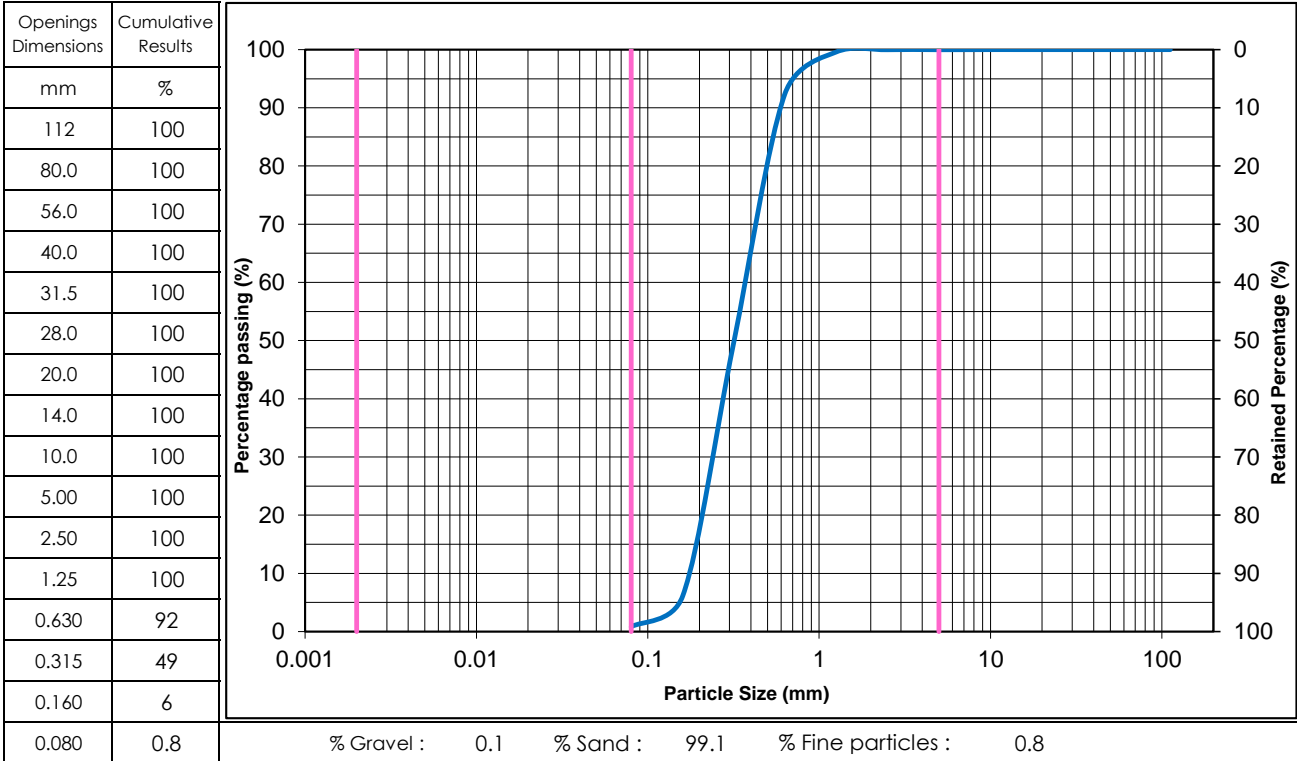
Prepared by : Benoit Cyr, Geo. *BC* .Geo #786

Date : May 27, 2022

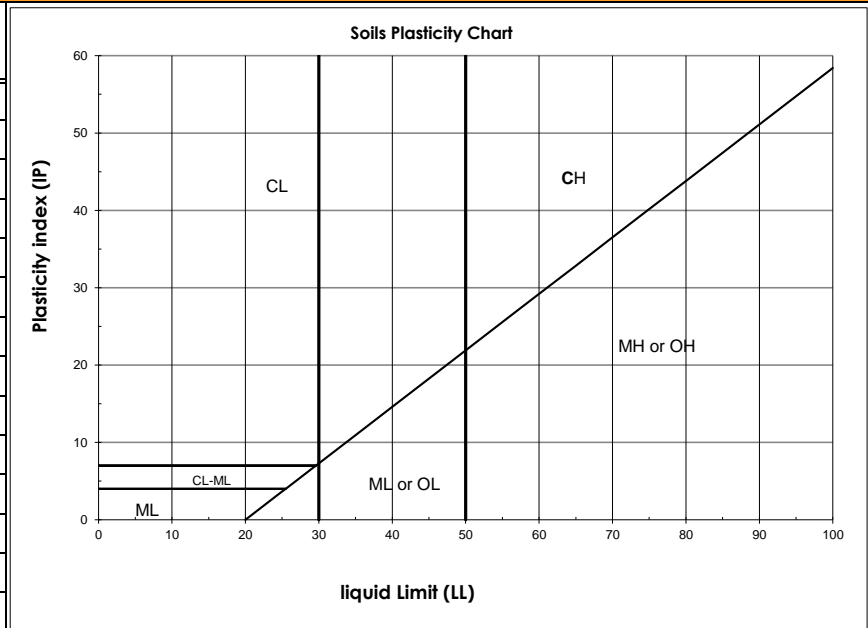
Client : Cree Developpement Corporation
 Project : La Grande Alliance - Feasibility Study - Phase I
 Grevet-Chapais Railway
 Project No : 158100425.500.710.4
 Sample No : GD-222.2-TP22-02 MA-03
 Depth : 2,0 - 3,0m

Sampled by : M. Frigon/ T. Coulaux
 Sampling Date : March 21, 2022

Material Description : Sand, traces of fine particles,
 traces of Gravel

Grain Size Analysis (BNQ 2501-025)

Other tests

Test / Standard	Results



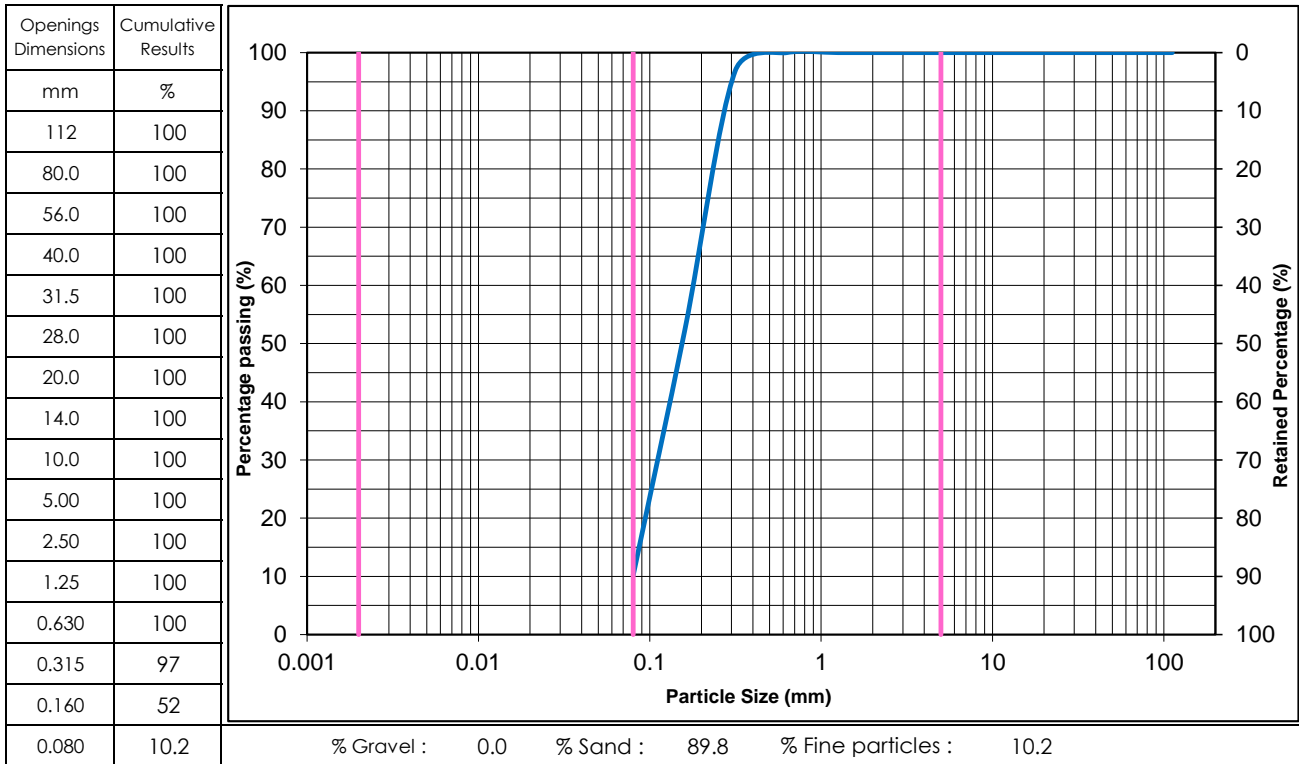
Remarks :

Prepared by : Benoit Cyr, Geo. *BJ .Geo #786*

Date : May 27, 2022

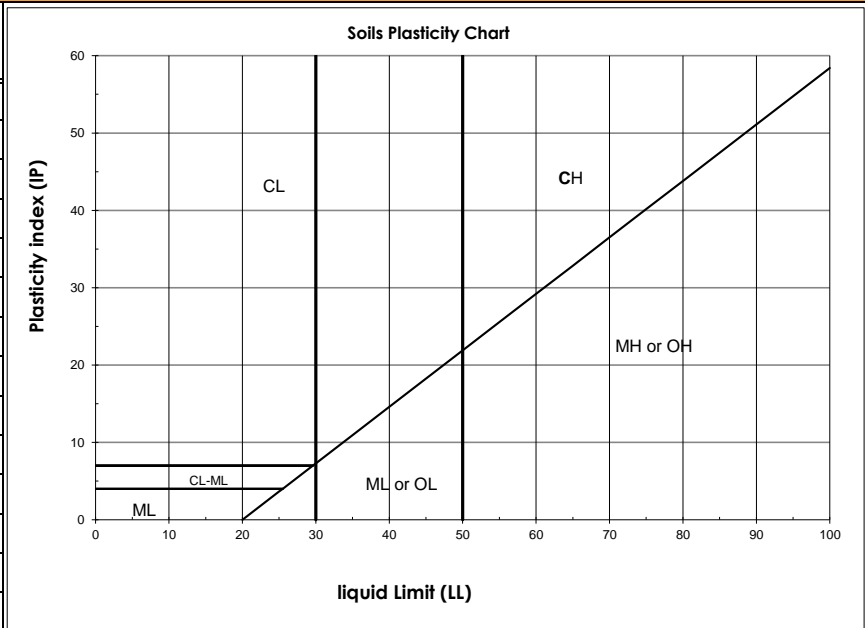
Client :	Cree Developpement Corporation	Sampled by :	M. Frigon/ T. Coulaux
Project :	La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date :	March 21, 2022
Project No :	158100425.500.710.4	Material Description :	Sand, some fine particles
Sample No :	GD-222.2-TP22-03 MA-02		
Depth :	1,0 - 2,0m		

Grain Size Analysis (BNQ 2501-025)



Other tests

Test / Standard	Results

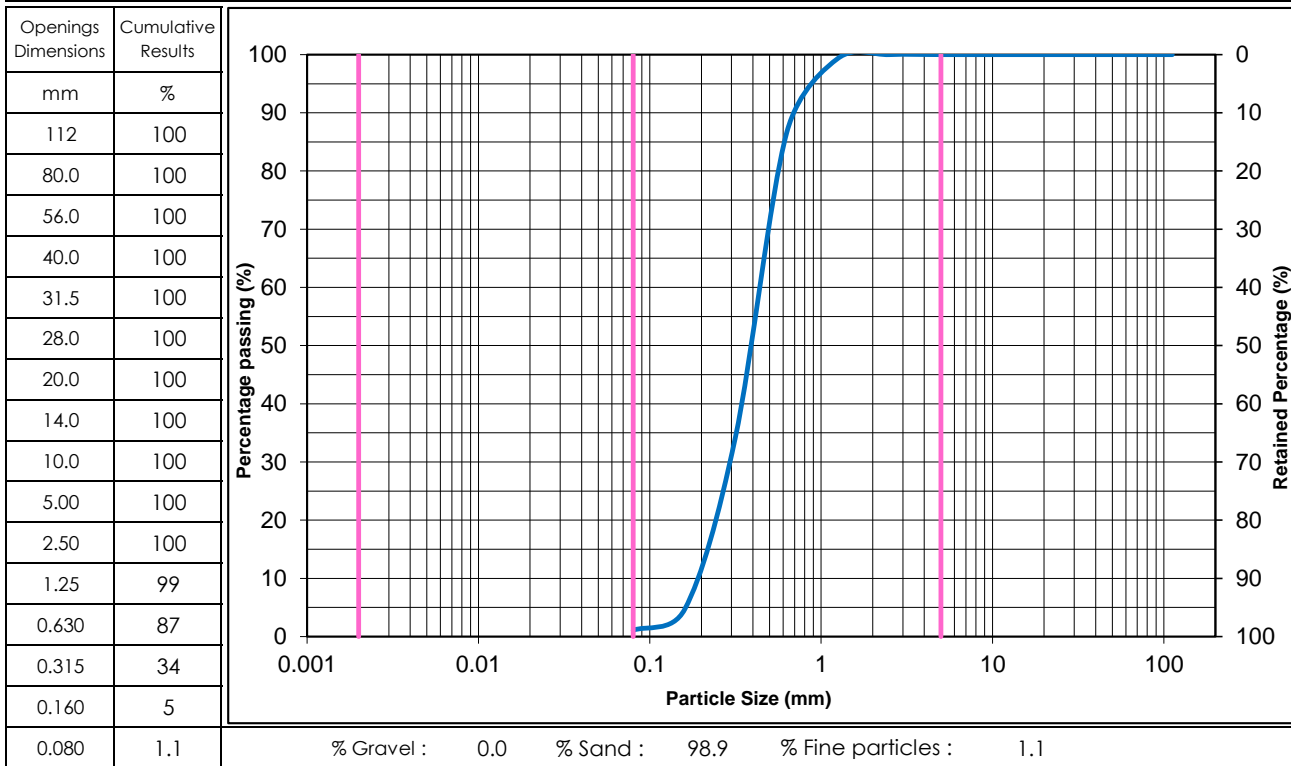


Remarks :

Prepared by : Benoit Cyr, Geo. *BJ* .Geo #786 Date : May 27, 2022

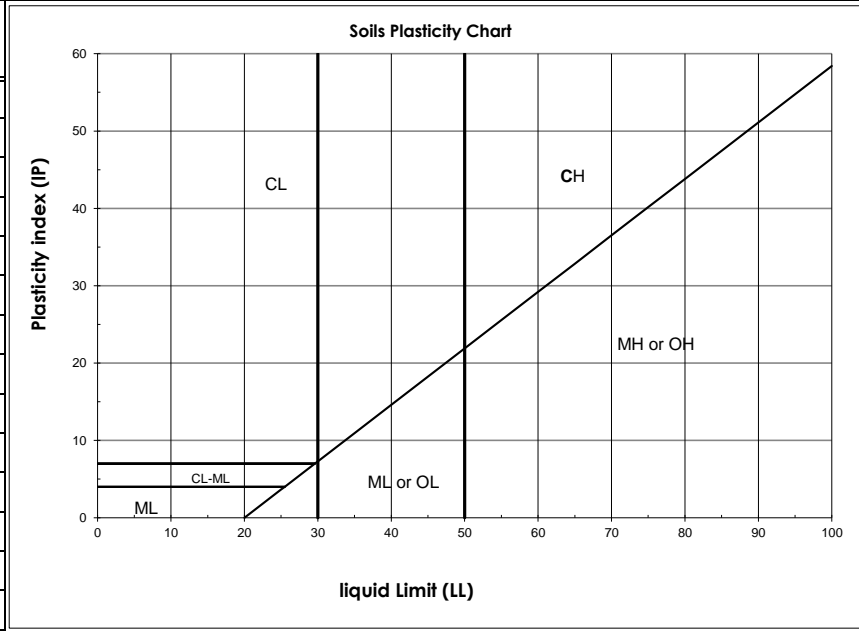
Client : Cree Developpement Corporation	Sampled by : M. Frigon/ T. Coulaux
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampling Date : March 21, 2022
Project No : 158100425.500.710.4	
Sample No : GD-222.2-TP22-03 MA-04	Material Description : Sand, traces of fine particles
Depth : 3,0 - 4,0m	

Grain Size Analysis (BNQ 2501-025)



Other tests

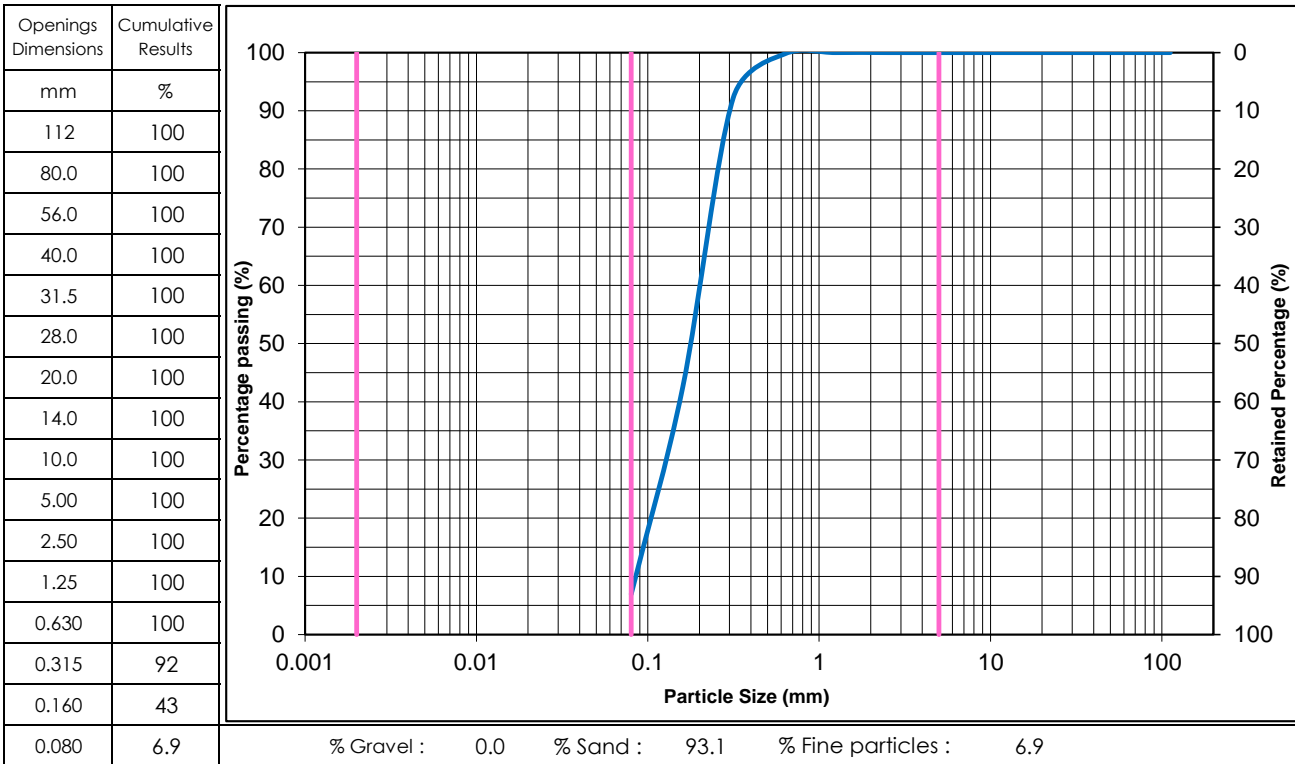
Test / Standard	Results



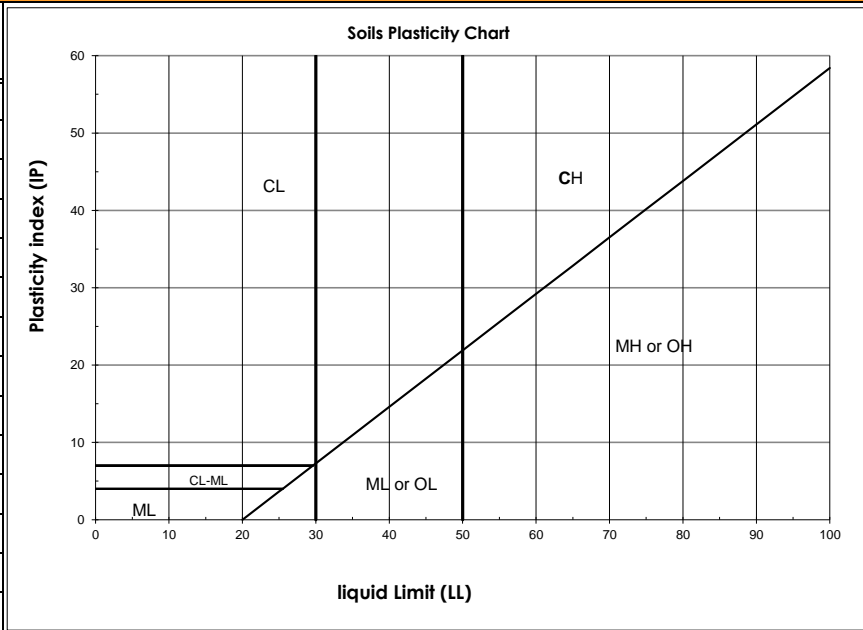
Remarks : _____

Prepared by : Benoit Cyr, Geo. *BJ Geo #786* **Date :** May 27, 2022

Client : Cree Developpement Corporation Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway Project No : 158100425.500.710.4 Sample No : GD-222.2-TP22-04 MA-03 Depth : 2,0 - 3,0m	Sampled by : M. Frigon/ T. Coulaux Sampling Date : March 20, 2022 Material Description : Sand, traces of fine particles
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Grain Size Analysis (BNQ 2501-025)

Other tests

Test / Standard	Results

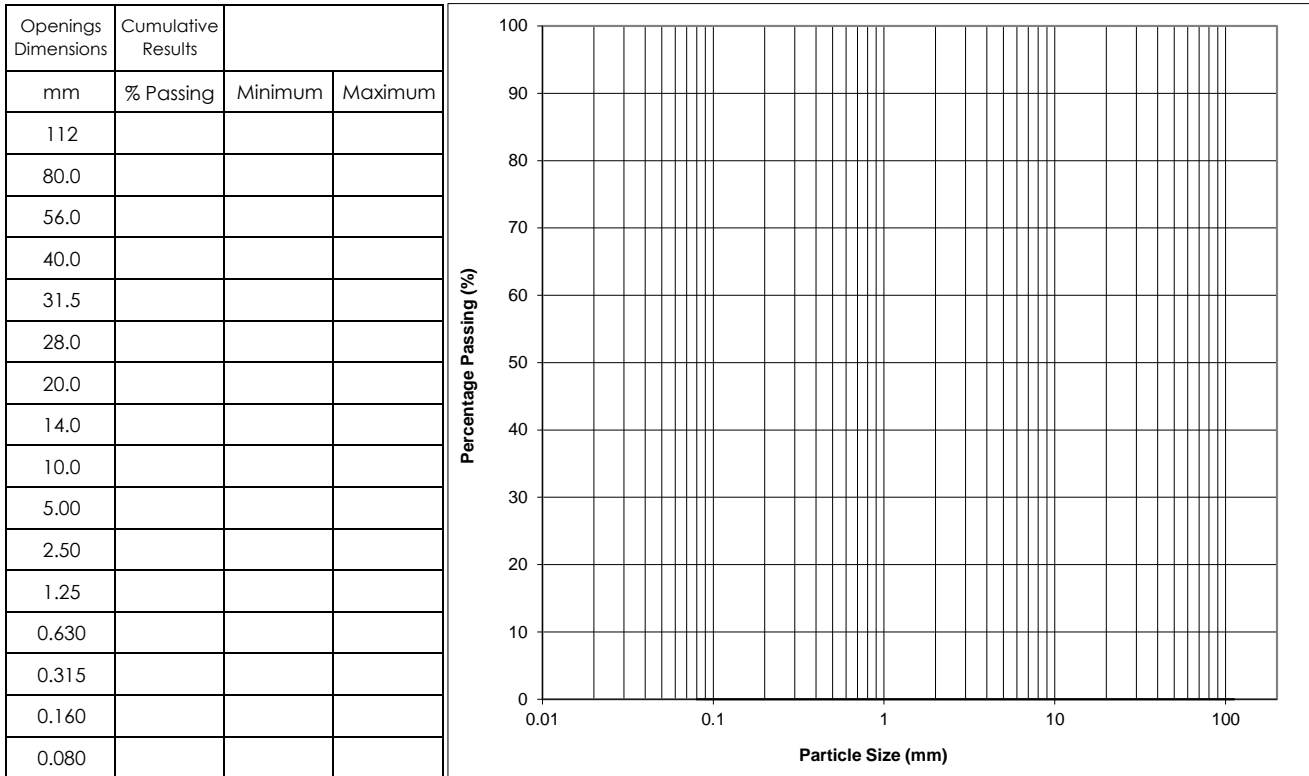


Remarks : _____

Prepared by : Benoit Cyr, Geo. *BY Geo #186* **Date :** May 27, 2022

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Hugo Desrochers
Project No : 158100425.500.710.4	Sampling Date : November 08, 2022
Sample No : Q-190.9-BH22-01 DC-02 to DC-04	
Depth : 1,22 - 5,87m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)



Soils Classification

Modified Proctor (BNQ 2501-255)

% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests

Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	11						
Micro Deval (grading F) (LC 21-070) (%)	5						

Remarks : _____

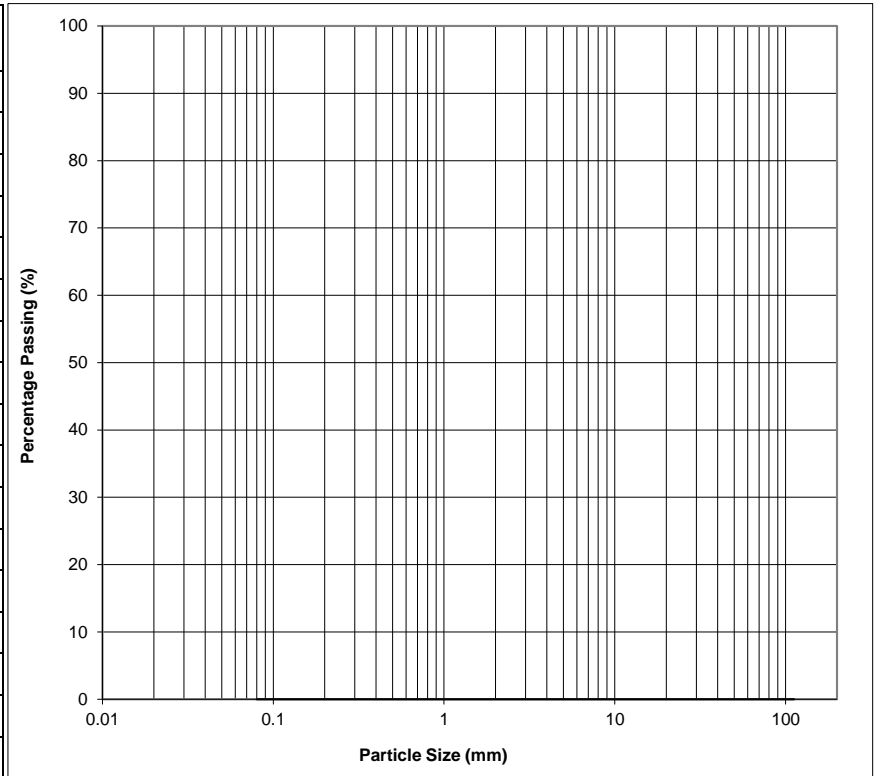
Prepared By: Benoit Cyr, Geo. *BJ* .Geo #786

Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Hugo Desrochers
Project No : 158100425.500.710.4	Sampling Date : November 08, 2022
Sample No : Q-190.9-BH22-01 DC-05 to DC-08	
Depth : 5,87 - 10,24m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)

Openings Dimensions	Cumulative Results		
mm	% Passing	Minimum	Maximum
112			
80.0			
56.0			
40.0			
31.5			
28.0			
20.0			
14.0			
10.0			
5.00			
2.50			
1.25			
0.630			
0.315			
0.160			
0.080			



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	10						
Micro Deval (grading F) (LC 21-070) (%)	5						

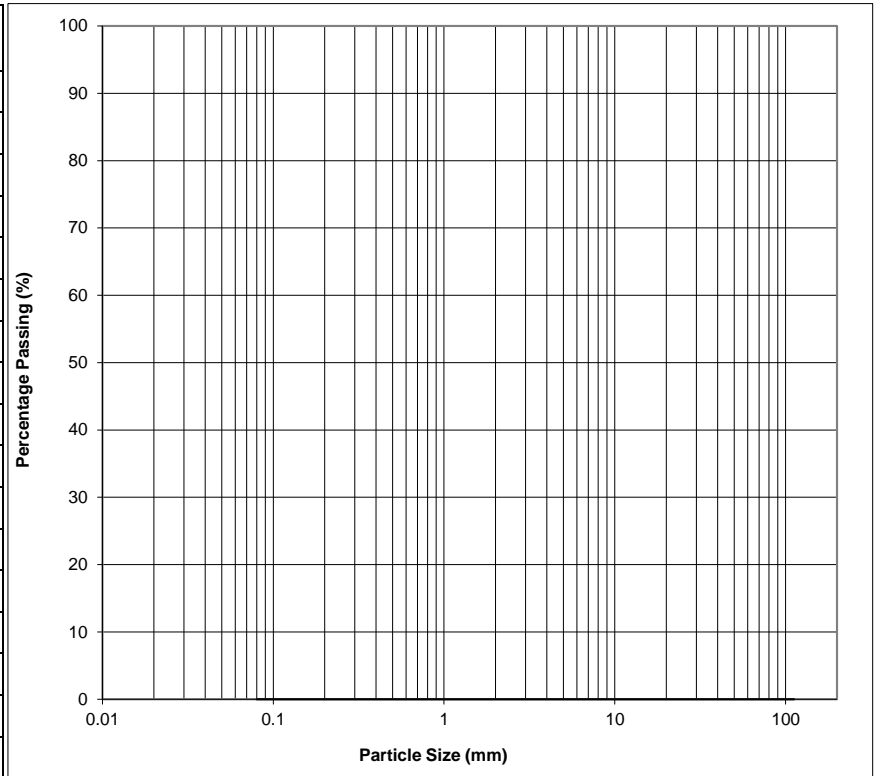
Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* ^{Geo} #186 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Hugo Desrochers
Project No : 158100425.500.710.4	Sampling Date : November 09, 2022
Sample No : Q-190.9-BH22-02 DC-02 to DC-05	
Depth : 1,37 - 5,00m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)

Openings Dimensions	Cumulative Results		
mm	% Passing	Minimum	Maximum
112			
80.0			
56.0			
40.0			
31.5			
28.0			
20.0			
14.0			
10.0			
5.00			
2.50			
1.25			
0.630			
0.315			
0.160			
0.080			



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

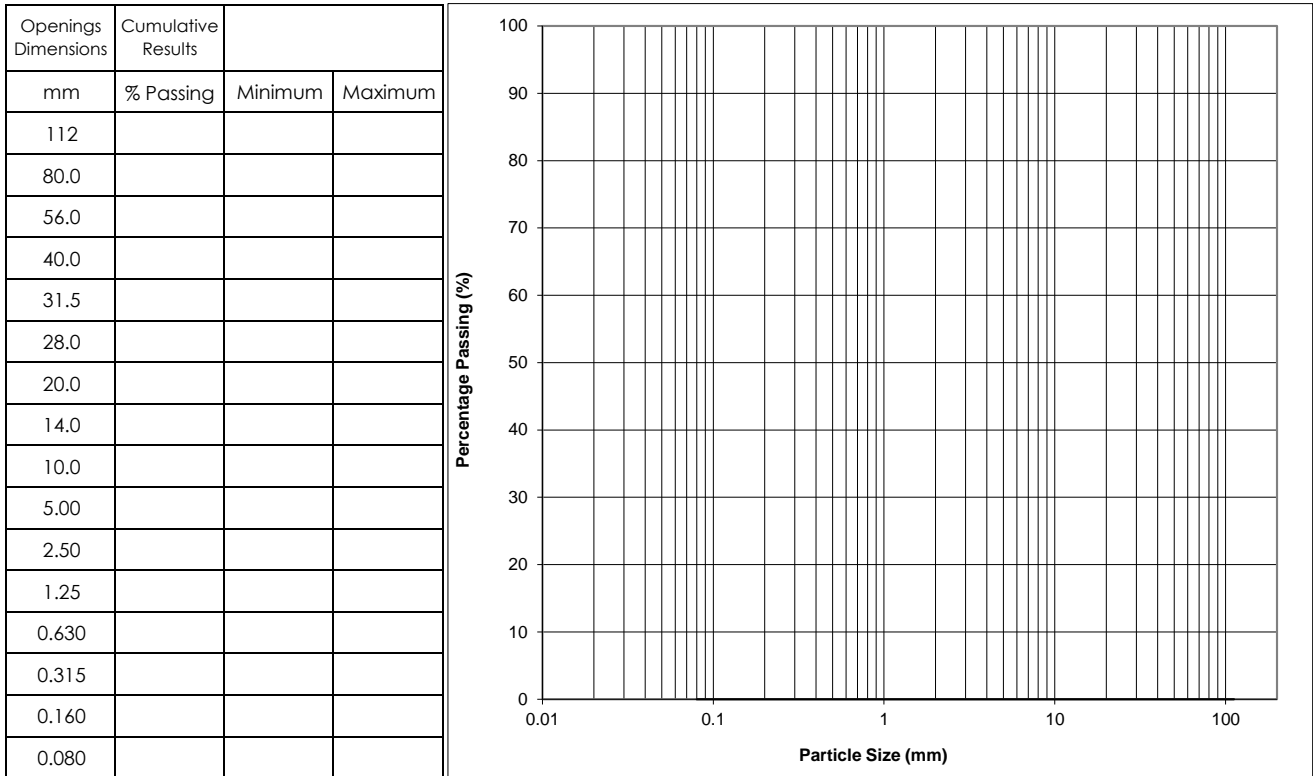
Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	10						
Micro Deval (grading F) (LC 21-070) (%)	5						

Remarks : _____

Prepared By: Benoit Cyr, Geo. *Bj* .Geo #486 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Hugo Desrochers
Project No : 158100425.500.710.4	Sampling Date : November 09, 2022
Sample No : Q-190.9-BH22-02 DC-06 to DC-09	
Depth : 5,00 - 9,83m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

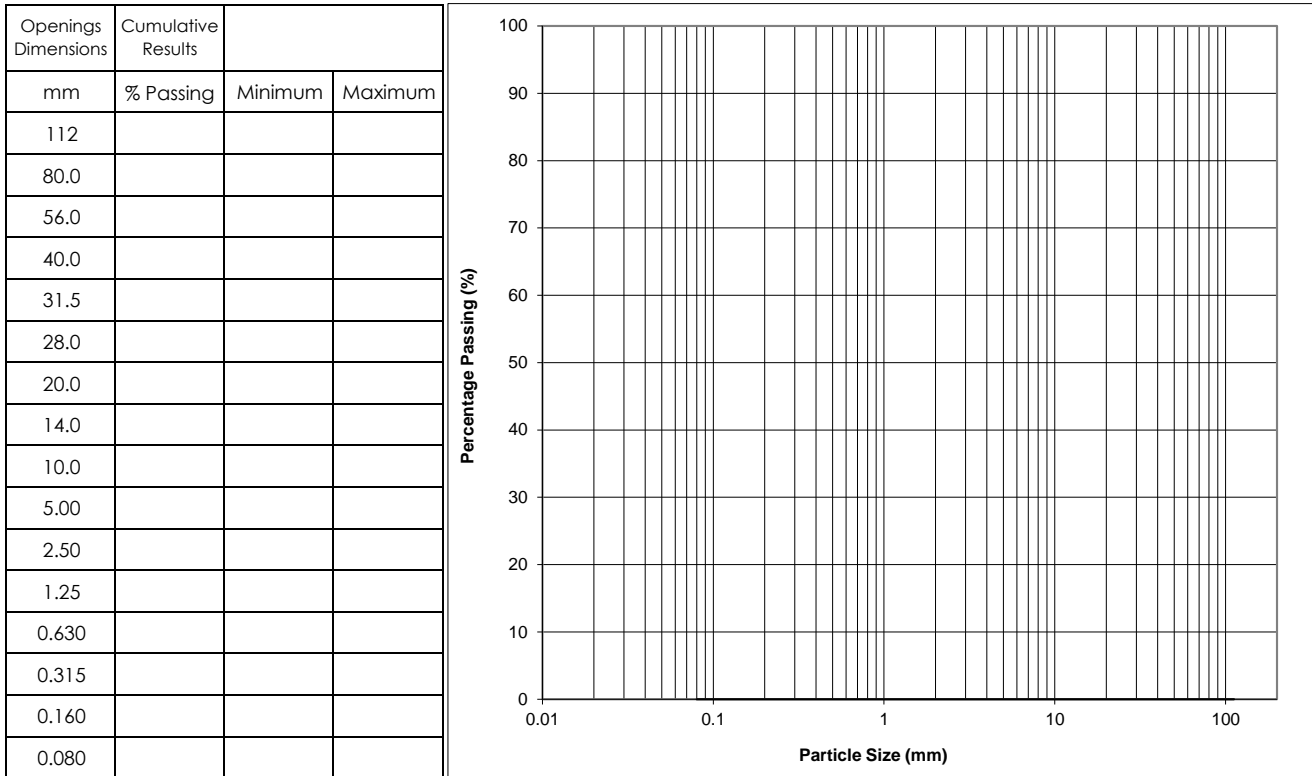
Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	13						
Micro Deval (grading F) (LC 21-070) (%)	9						

Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* .Geo #786 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 25, 2022
Sample No : Q-228-BH22-02 DC-02 to DC-05	
Depth : 0,23 - 5,89m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)



Soils Classification

Modified Proctor (BNQ 2501-255)

% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests

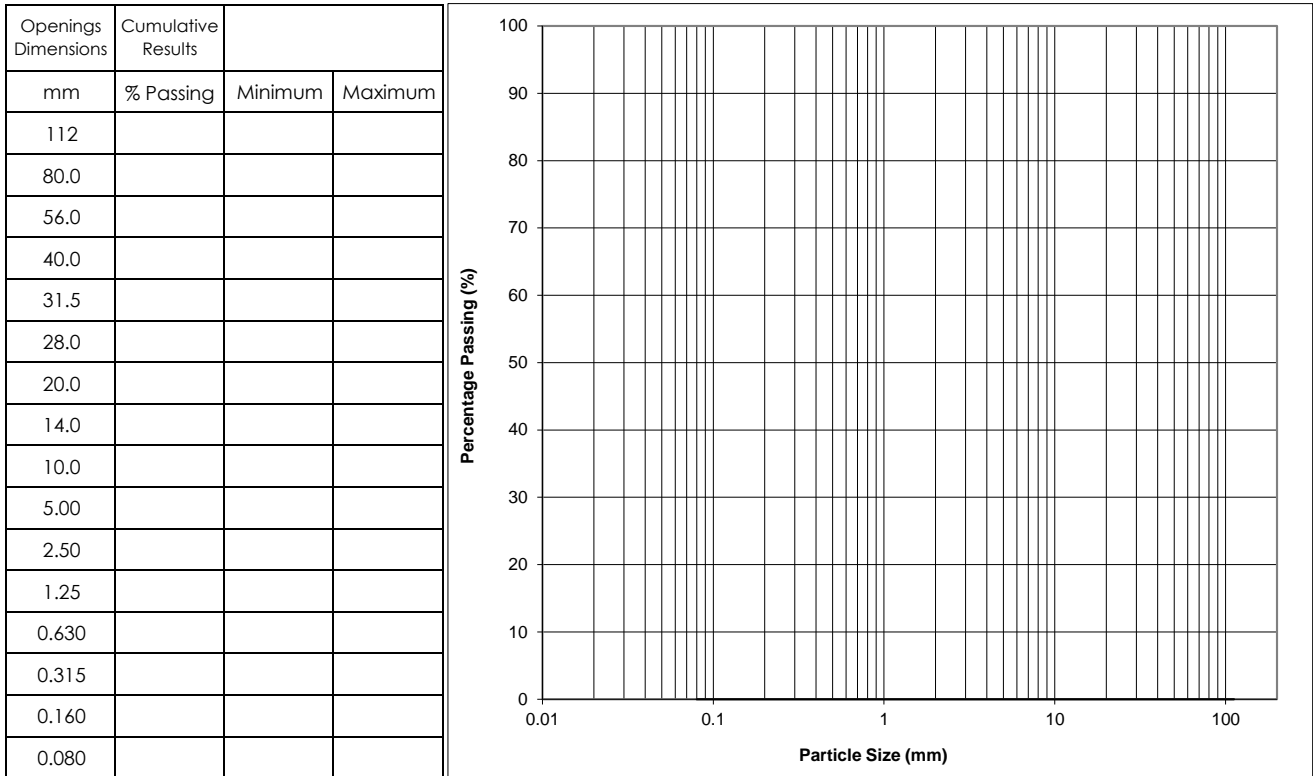
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	14						
Micro Deval (grading F) (LC 21-070) (%)	10						

Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* .Geo #786 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 25, 2022
Sample No : Q228-BH22-02 DC-06 to DC-08	
Depth : 5,89 - 10,16m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	11						
Micro Deval (grading F) (LC 21-070) (%)	7						

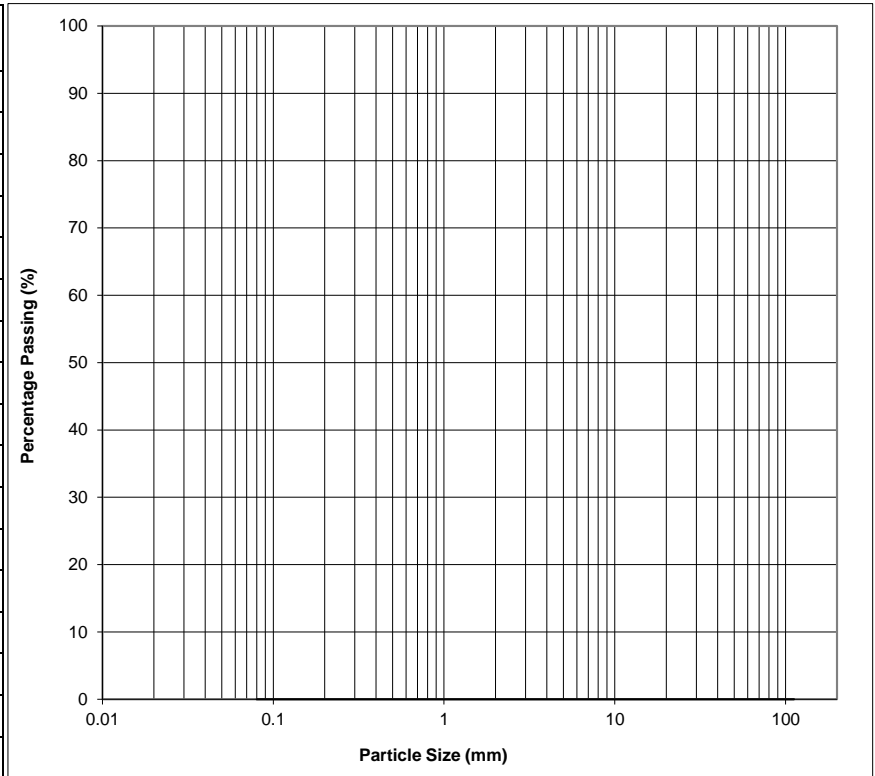
Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* Geo #786 _____ Date: January 27, 2023 _____

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 26, 2022
Sample No : Q-228-BH22-03 DC-03 to DC-07	
Depth : 2,34 - 8,05m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)

Openings Dimensions	Cumulative Results		
mm	% Passing	Minimum	Maximum
112			
80.0			
56.0			
40.0			
31.5			
28.0			
20.0			
14.0			
10.0			
5.00			
2.50			
1.25			
0.630			
0.315			
0.160			
0.080			



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	14						
Micro Deval (grading F) (LC 21-070) (%)	4						

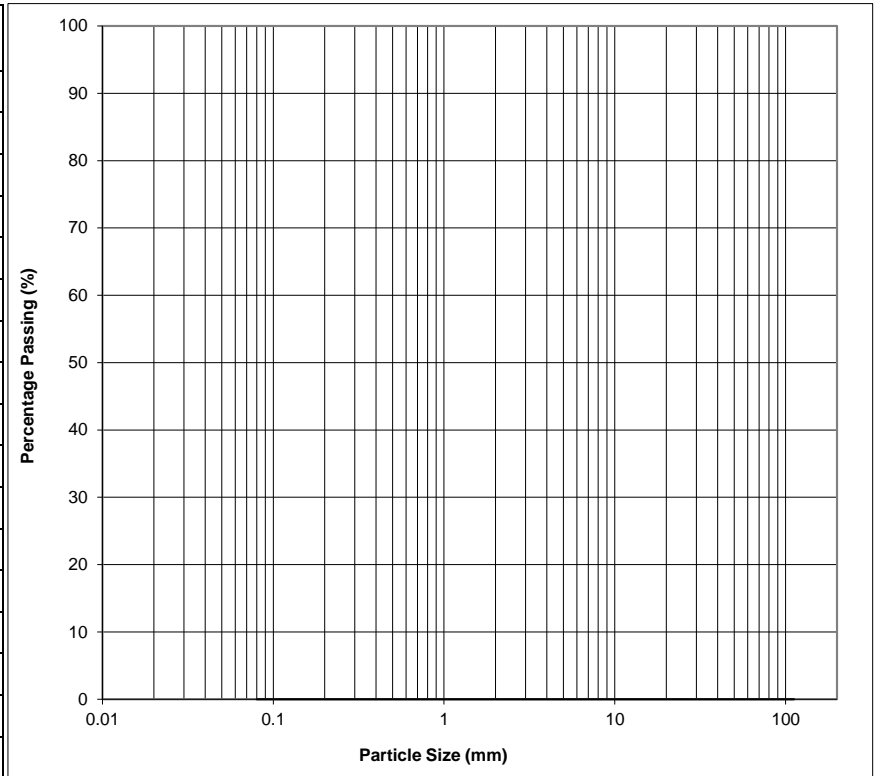
Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* .Geo #786 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 27, 2022
Sample No : Q-302-BH22-01 DC-02 to DC-04	
Depth : 1,07 - 5,69m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)

Openings Dimensions	Cumulative Results		
mm	% Passing	Minimum	Maximum
112			
80.0			
56.0			
40.0			
31.5			
28.0			
20.0			
14.0			
10.0			
5.00			
2.50			
1.25			
0.630			
0.315			
0.160			
0.080			



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	21						
Micro Deval (grading F) (LC 21-070) (%)	8						

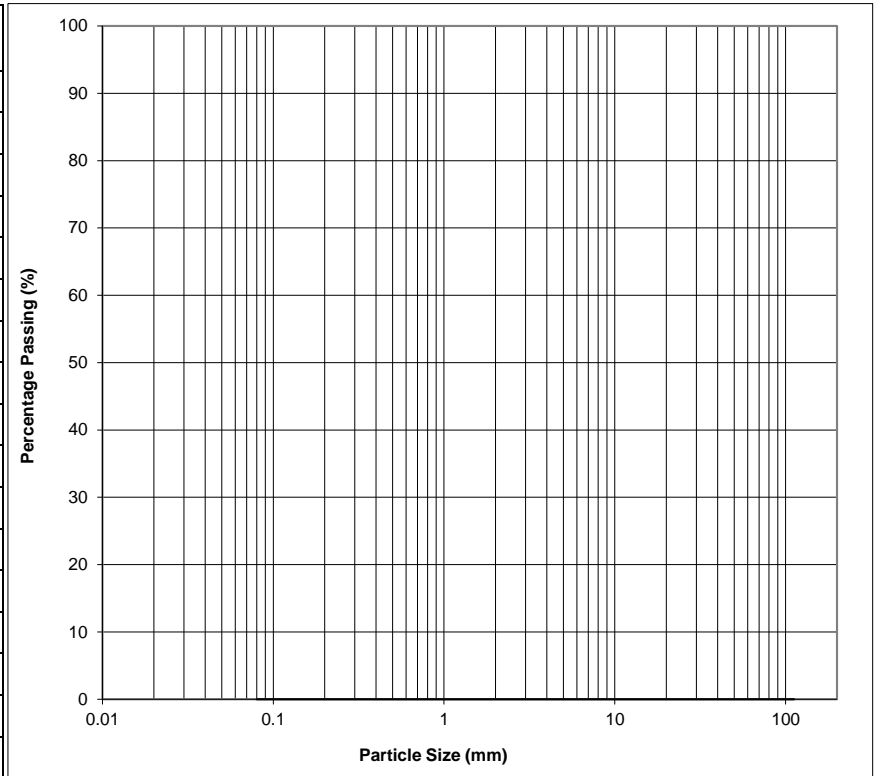
Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* Geo #186 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 27, 2022
Sample No : Q-302-BH22-01 DC-05 to DC-07	
Depth : 5,69 - 9,22m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)

Openings Dimensions	Cumulative Results		
mm	% Passing	Minimum	Maximum
112			
80.0			
56.0			
40.0			
31.5			
28.0			
20.0			
14.0			
10.0			
5.00			
2.50			
1.25			
0.630			
0.315			
0.160			
0.080			



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

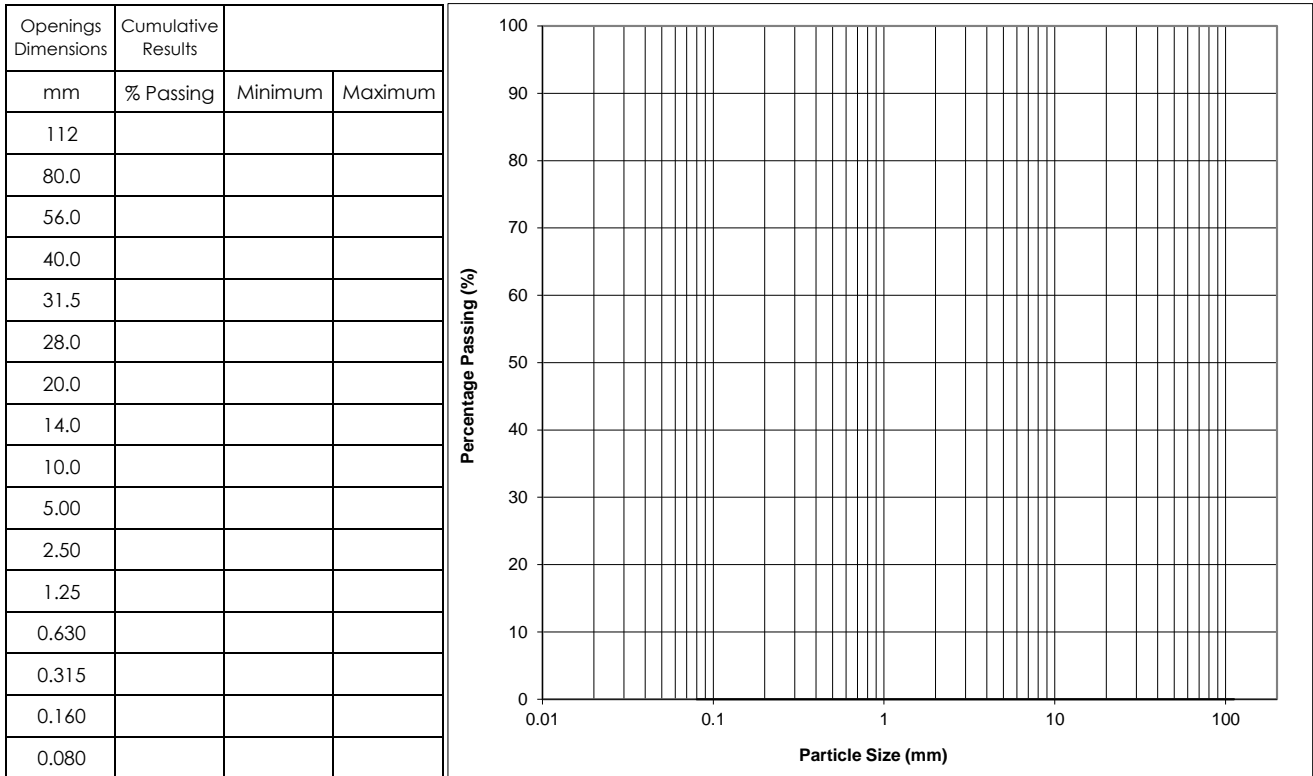
Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	19						
Micro Deval (grading F) (LC 21-070) (%)	8						

Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* .Geo #786 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 28, 2022
Sample No : Q-302-BH22-02 DC-02 to DC-05	
Depth : 0,30 - 5,69m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	24						
Micro Deval (grading F) (LC 21-070) (%)	10						

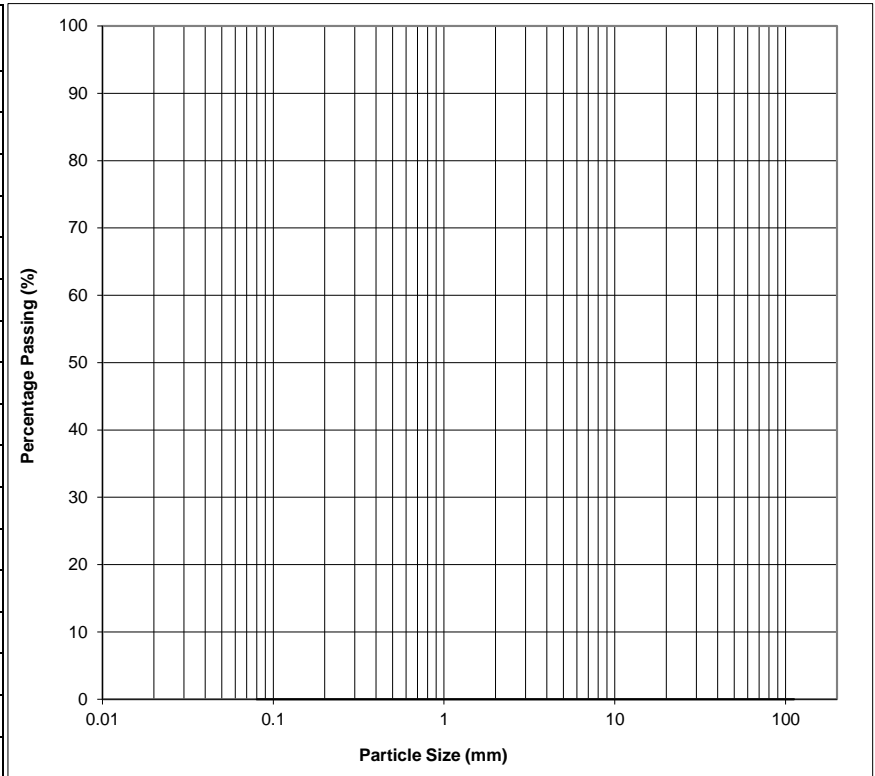
Remarks : _____

Prepared By: Benoit Cyr, Geo. *BC* #386 Date: January 27, 2023

Client : Cree Development Corporation	Type of material : Crushed rock cores
Project : La Grande Alliance - Feasibility Study - Phase I Grevet-Chapais Railway	Sampled by : Khaled Haiek
Project No : 158100425.500.710.4	Sampling Date : August 28, 2022
Sample No : Q-302-BH22-02 DC-05 to DC-09	
Depth : 5,69 - 10,57m	

Sieve Analysis (LC 21-040 / BNQ 2501-025)

Openings Dimensions	Cumulative Results		
mm	% Passing	Minimum	Maximum
112			
80.0			
56.0			
40.0			
31.5			
28.0			
20.0			
14.0			
10.0			
5.00			
2.50			
1.25			
0.630			
0.315			
0.160			
0.080			



Soils Classification		Modified Proctor (BNQ 2501-255)	
% Gravel		Testing Method used	
% Sand		Maximum Dry Unit Weight (kg/m ³)	
% Fine Particles		Optimum Moisture Content (%)	

Other Tests							
Test / Standard	Results	Requirements		Test / Standard	Results	Requirements	
		Min	Max			Min	Max
Los Angeles (grading B) (LC 21-400) (%)	25						
Micro Deval (grading F) (LC 21-070) (%)	9						

Remarks : _____

Prepared By: Benoit Cyr, Geo. *BJ* .Geo #786 Date: January 27, 2023

Appendix E Photographic Album





Photo 1: GD-174-TP22-01



Photo 2: GD-174-TP22-02



Photo 3: GD-174-TP22-03



Photo 4: GD-174-TP22-04



Photo 5: GD-174-TP22-05



Photo 6: GD-174-TP22-06





Photo 7: GD-174-TP22-07



Photo 8: GD-174-TP22-08



Photo 9: GD-174-TP22-09



Photo 10: GD-174-TP22-10





Photo 1: GD-222.2-TP22-01

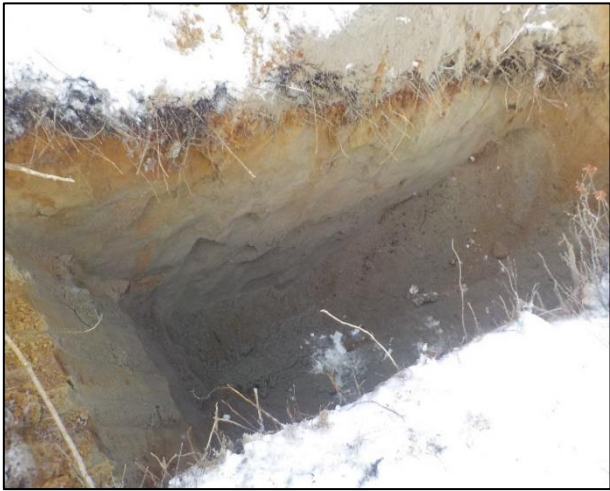


Photo 2: GD-222.2-TP22-02



Photo 3: GD-222.2-TP22-03



Photo 4: GD-222.2-TP22-04



Photo 5: GD-222.2-TP22-05



Photo 6: GD-222.2-TP22-06





Photo 1: Q-190.9-BH22-01 (Wet)



Photo 2: Q-190.9-BH22-01 (Dry)



Photo 3: Q-190.9-BH22-02 (Wet)

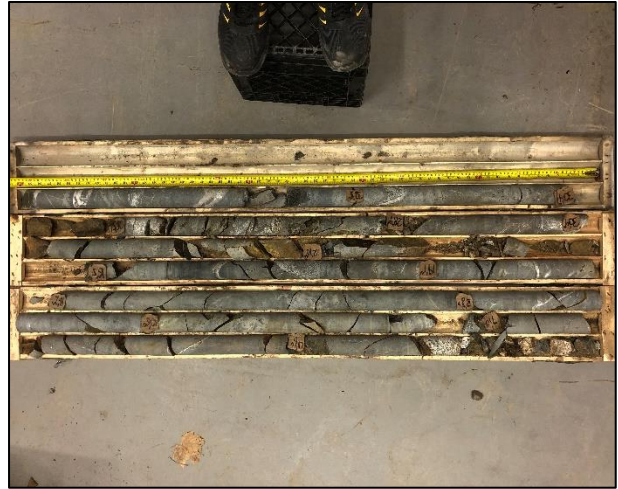


Photo 4: Q-190.9-BH22-02 (Dry)



Photo 1: Q-228-BH22-01 (Wet)



Photo 2: Q-228-BH22-01 (Dry)



Photo 3: Q-228-BH22-02 (Wet)



Photo 4: Q-228-BH22-02 (Dry)





Photo 1: Q-302-BH22-01 (Wet)



Photo 2: Q-302-BH22-01 (Dry)



Photo 3: Q-302-BH22-02 (Wet)



Photo 4: Q-302-BH22-02 (Dry)