



ENGINEERING CONSULTING SERVICES
VOLUME 6 - APPENDIX
**APPENDIX 6.1.11 – POTENTIAL BORROW
SOURCES AND QUARRY SITES ASSESSMENT
– ROUTE DU NORD**
FEASIBILITY STUDY FINAL REPORT PHASE I



Consultant Reference: LGA-1-GN-F-FRN-RT-0006_00_6.1.11
2023-03-31



Stantec ■ **DESFOR** ■ **SYSTRA**

with subconsultant





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

**POTENTIAL BORROW SOURCES
AND QUARRY SITES ASSESSMENT –
ROUTE DU NORD**

February 22, 2023

Prepared for:

Cree Development Corporation and
Vision Eeyou Istchee

Prepared by:

Stantec Consulting Ltd.

158100425

**LA GRANDE ALLIANCE FEASIBILITY STUDY – PHASE I
POTENTIAL BORROW SOURCES AND QUARRY SITES ASSESSMENT - ROUTE DU NORD**

Revision	Description	Author		Quality Check		Independent Review	
00	Final Report	F. Vinet	2023-02-14	O. Piraux	2023-02-15	A. El-Dana	2023-02-17



**LA GRANDE ALLIANCE FEASIBILITY STUDY – PHASE I
POTENTIAL BORROW SOURCES AND QUARRY SITES ASSESSMENT - ROUTE DU NORD**

The conclusions in the Report titled LA GRANDE ALLIANCE FEASIBILITY STUDY – PHASE I - POTENTIAL BORROW SOURCES AND QUARRY SITES ASSESSMENT - ROUTE DU NORD are Stantec’s professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient’s own risk.

Stantec has assumed all information received from Cree Development Corporation (the “Client”) and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec’s contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec’s discretion.

Prepared by:   Signature numérique de
Vinet, Frederic
Date : 2023.03.17
14:36:33 -04'00'

Signature

Frédéric Vinet, géo, M.Sc.

Printed Name

Verified by: **Piroux,
Olivier**  Digitally signed by Piroux,
Olivier
Date: 2023.03.17
15:43:09 -04'00'

Signature

Olivier Piroux, M.Sc.

Printed Name

Approved by: 

Signature

Afif El-Dana, ing. DESS, PMP

Printed Name



Table of Contents

1.0 INTRODUCTION..... 1
 1.1 GENERAL 1
 1.2 SCOPE OF WORK..... 3
 1.3 BORROW MATERIAL REQUIREMENTS..... 3
2.0 STUDY AREA AND BACKGROUND REVIEW..... 4
3.0 METHODOLOGY 5
 3.1 PHOTO INTERPRETATION AND IDENTIFICATION OF POTENTIAL BORROW
 SOURCES AND QUARRY SITES..... 5
 3.2 VOLUME CALCULATION 6
4.0 RESULTS 7
 4.1 POTENTIAL GRANULAR BORROW SOURCES 7
 4.2 POTENTIAL QUARRY SITES 8
 4.3 POTENTIAL BORROW SOURCES AND QUARRIES IDENTIFIED BY THE
 SDBJ..... 8
5.0 DISCUSSION AND CONCLUSION..... 9
6.0 REFERENCES.....10

LIST OF TABLES

Table 1 Summary of the Material Requirements for the Improvement Works Along the
 Route Du Nord..... 3
 Table 2 Aerial Photos Used for the Identification of Potential Borrow Sources and Quarry
 Sites 6

LIST OF FIGURES

Figure 1 La Grande Alliance – Phase I Feasibility Study Area Overview 2

LIST OF APPENDICES

APPENDIX A STATEMENT OF GENERAL CONDITIONS
 APPENDIX B SUMMARY TABLES
 APPENDIX C FIGURES
 APPENDIX D SITES IDENTIFIED BY THE SDBJ



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 Grand Alliance. The program aims at improving and building major transportation infrastructures on the territory, including the implementation of a railway alongside the Billy Diamond Highway to Whapmagoostui, where the construction of a deepwater port will be considered. The current study is divided into three phases, Phase I being carried out by Vision Eeyou Istchee Consortium, focusing on the feasibility design of the following infrastructures:

- Upgrade of the existing access roads between the Billy Diamond Highway 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 kilometre post (hereafter, KP) 257;
- Upgrade and paving 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.



**LA GRANDE ALLIANCE FEASIBILITY STUDY – PHASE I
POTENTIAL BORROW SOURCES AND QUARRY SITES ASSESSMENT - ROUTE DU NORD**

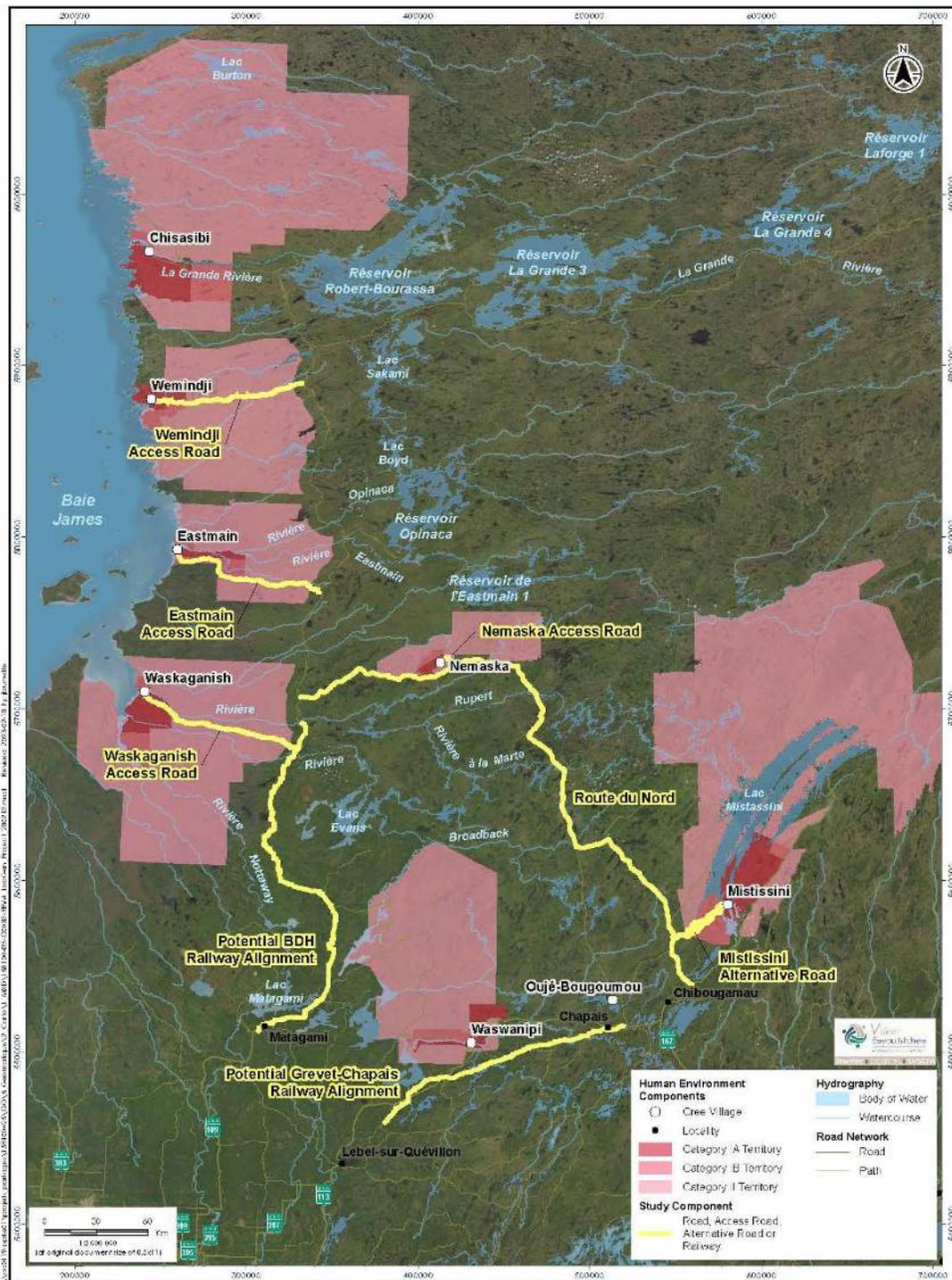


Figure 1 La Grande Alliance – Phase I Feasibility Study Area Overview



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. granular borrow sources and bedrock quarries) able to supply structural fill for the construction and/or upgrade of the different infrastructures.

This report presents the results of the desktop assessment to identify potential borrow sources and quarry sites along the Route du Nord. No intrusive investigation was conducted for borrow material in the vicinity of Route du Nord at the stage of the mandate.

The main tasks performed regarding the identification of potential borrow source and quarry sites consisted in the:

- Selection and acquisition of aerial photos covering the study area;
- Compilation and review of data related to the geology and the surficial deposits;
- Photo interpretation and delineation of sectors showing potential for material extraction (granular materials and bedrock); and
- Preparation of a summary report presenting the main characteristics of the potential borrow sources and quarry sites, including an estimate of the potentially extractable volumes.

1.3 Material Requirements

Preliminary estimates of borrow materials required for the upgrade of the Route du Nord 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 Improvement Works Along the Route du Nord

Type of material	Volume (compacted) (m³)
MG-112	641 000
MG-20	1 563 000
Pavement (ESG-10 and ESG-14)	355 000



2.0 Study Area and Background Review

The study area extends from the KP 0 of the Route du Nord which is located at the intersection between the Route 167 (approximately 18 km east of the city of Chibougamau) and the KP 407 located at the northwest extremity of the road, at the intersection with the Billy Diamond Highway. The study area has a maximum width of 10 km and consists of an offset of 5 km on each side of the Route du Nord. 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 (SIGÉOM, 2023) shows that the Route du Nord area is underlain by Archean bedrock belonging to the Superior Province and covering four (4) subprovinces: The Abitibi Subprovince in the Chibougamau sector (KP 0 to 22), the Opatica Subprovince (KP 22 to 256), the La Grande Subprovince (KP 256 to 400), and the Nemiscau Subprovince (KP 400 to 407). These subprovinces are characterized by an alternation of linear metasedimentary (Nemiscau) and volcano-plutonic (Abitibi, Opatica, and La Grande) rocks, and show an east-west regional structural geology orientation (MRNFQ, 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 peaked around 7,900 BP (Hardy, 1977). Glaciomarine silt and clay accumulated on the low-lying areas and coarser deposits accumulated along the former Tyrrell Sea shorelines. Locally, marine clay covers the glaciolacustrine sediments of the Lake Ojibway, which are usually 10 to 15 m thick (Hardy, 1982). Peat bogs and fens have accumulated over the glacial and non-glacial deposits, especially over poorly drained glaciomarine and morainal (till) deposits.

The surficial deposits along the Route du Nord consist mainly of till and glaciofluvial deposits, and accumulations of organic material. Exposed bedrock surfaces, or bedrock covered with a thin layer of overburden, are also common. The till deposits are regularly fluted along a northeast/ southwest axis along the road. Some glaciofluvial corridors with eskers and outwash deposits are crossed by the Route du Nord from the Chibougamau area to the KP 290 area (Sakami moraine). West of the Sakami moraine, glaciofluvial deposits are mostly absent while glaciomarine and glaciolacustrine deposits occupy depressions and low elevation terrains (SIGÉOM, 2023).



3.0 Methodology

3.1 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 Tyrell 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 : 40 000 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 3-1.

The potential borrow sources and quarry sites were selected based on their distance from the Route du Nord 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. The sites are identified by the prefixes GD (Granular Deposit) or Q (Quarry) followed by the kilometre point of their location (i.e.: GD-5 or Q-38.2).



**LA GRANDE ALLIANCE FEASIBILITY STUDY – PHASE I
POTENTIAL BORROW SOURCES AND QUARRY SITES ASSESSMENT - ROUTE DU NORD**

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

Year	Roll	N° of aerial photo	Scale
1983	Q83868	8 to 10; 40 and 41; 59 to 60; 89 and 90; 111 and 112; 153 and 154; 174 and 175	1: 40 000
1983	Q83869	21 and 22; 43 to 45; 70 to 72; 97 and 98; 117 and 118	1: 40 000
1990	Q90821	32 and 33; 64 and 65; 126 to 128; 159 and 160	1: 40 000
1990	Q90822	51 to 53; 88 and 89; 141 and 142; 182 to 188; 219 and 220; 226 and 227	1: 40 000
1990	Q90824	40 to 42; 103 and 104; 153 and 154	1: 40 000
1990	Q90825	48 and 49; 78 to 83; 153 to 156; 179 to 181	1: 40 000
1990	Q90826	104 to 115	1: 40 000
1990	Q90827	107 and 108	1: 40 000
1990	Q90836	55 to 57	1: 40 000
1990	Q90839	202 to 209	1: 40 000
1990	Q90847	73 to 79	1: 40 000

3.2 Volume Calculation

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 was based on the photo interpretation. For some sectors, publicly available digital elevation models (DEM) derived from the LiDAR data (Données Québec, 2019-2020) 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 avoid overestimating the material availability.



4.0 Results

Based on the findings from the photo interpretation, eleven (11) potential borrow sources and eight (8) potential quarry sites were identified as being more likely to contain suitable construction materials to support the study. The potential borrow sources consist of glaciofluvial and littoral landforms, which are the most common sources of sand and gravel in the James Bay region. The potential quarry sites consist of bedrock hills of variable sizes which are expected to be mineable to a depth of about 10 m.

The main characteristics of potential borrow sources and quarry sites identified as part of the assessment are shown in Table B-1 and B-2 (Appendix B). A general map of the site locations and site-specific figures are presented in Appendix C.

4.1 Potential Granular Borrow Sources

Of the eleven (11) potential borrow sources, ten (10) consist of the extension of existing borrow pits. Those existing borrow pits are located at KP 5, KP 13, KP 28, KP 45.5, KP 78.6, KP 116.3, KP 125.1, KP 176, KP 289.4, and KP 312 of the Route du Nord. A new potential borrow source is located along the KP 139.7 of the Route du Nord, but even for this site, existing borrow sources were already exploited within the same esker ridge on both sides of the Route du Nord. However, a distinct site was delineated to avoid constraints related to the proximity of wetlands and waterbodies.

The potential borrow sources GD-5, GD-13, GD-28, GD-45.5, GD-78.6, GD-116.3, GD-125.1 and GD-139.7 consist mainly of esker ridges and undulating glaciofluvial or outwash deposits. They are expected to be composed of sand with variable proportions of gravel and cobbles. Further east along the road, the potential borrow sources GD-176, GD-289.4 and GD-312 are expected to be predominantly composed of sand with minor proportions of gravel.

Considering the proximity of wetlands, watercourses and waterbodies and a public road (Regulation respecting sand pits and quarries, 2022), the potential exploitable volumes of suitable materials range from approximately 75 000 to 500 000 m³. Generally, the borrow sources are more frequent and voluminous to the east of the Route du Nord and tend to be more distant and less voluminous west of the road. The estimated exploitable volume for each potential borrow source is presented in Table B-1 (Appendix B).

Since most of the delineated potential borrow sources are adjacent to existing borrow pits, the sites are expected to be easily accessible using the existing access roads. The new potential borrow source GD-139.7 can also be accessed using an existing logging trail.



4.2 Potential Quarry Sites

A total of eight (8) potential quarry sites were identified, which includes the extension of three (3) existing quarries and the delineation of five (5) potential new quarry sites. The existing quarries are located along the KP 237.2, KP 344.1, and KP 389.5, while the potential new quarry sites are located along the KP 38.2, KP 97.5, KP 104.6, KP 200.6, and KP 386.2.

The potential quarry sites selected are expected to allow for the bedrock extraction for an average thickness of about 10 m and is expected to be covered with minimal overburden thicknesses. Since no geotechnical field investigation was conducted on the delineated sites, no site-specific information regarding the bedrock lithology or quality is available. However, based on the existing bedrock mapping (SIGEOM, 2023), the potential quarry sites are mainly composed of intrusive rocks (granite to diorite, granodiorite, granitoids, and gabbro) gneiss, and basalt. The expected lithology (SIÉGOM, 2023) for each site is presented in Table B-2 (Appendix B).

Considering the presence of environmental constraints related to the proximity of wetlands, watercourses, waterbodies, and a public road (Regulation respecting sand pits and quarries, 2022), the potentially exploitable bedrock volumes at each site is expected to range from approximately 120 000 m³ to 500 000 m³. Taking into consideration a swell factor of 1.15, which considers the increase in volume related to the rock treatment (displacement and crushing) and the compacting, the expected volumes range from 138 000 to 575 000 m³. The potentially exploitable volume for each site is specified in Table B-2 (Appendix B).

Except for the three (3) existing quarries (Q-237.2, Q-344.1, and Q-389.5), and Q-200.6 which is adjacent to an existing borrow source, the new delineated sites would require the construction of access roads ranging between 65 and 500 m in length.

4.3 Potential Borrow Sources and Quarries Identified by the SDBJ

As part of a request for proposals (RFP) published in August 2022, the *Société de développement de la Baie-James* (SDBJ) had identified some potential borrow sources and quarry sites in order to conduct a geotechnical investigation. Since these materials are likely to be used in the future, the identified sites were not considered in this analysis. However, residual volumes could still be available when the construction works along the Route du Nord will take place. Thus, a future assessment of these sites could be performed to estimate the potential residual volumes. The information published by the SDBJ is provided in the Appendix D.



5.0 Discussion and Conclusion

As part of the Route du Nord upgrading and paving study, eleven (11) potential borrow sources and eight (8) potential quarry sites were identified along the Route du Nord. At this time, these potential sites are expected to contain sufficient material volumes to meet the study needs. The identified sites are distributed along the entire route (i.e., KP 5 to KP 386.2) in order to minimize the costs associated with the transportation of materials.

Of the eleven (11) borrow sources identified, ten (10) consist of existing sites that still have the potential to contain significant volumes of material. Similarly, three (3) of the eight (8) potential quarry sites identified are existing quarries that have been previously exploited. Other sites currently being pursued by the SDBJ may also contain volumes that could be used to support the Route du Nord upgrading and paving study. Therefore, an update of the potential borrow sources and quarry materials available should be conducted at later stages of the program. Based on this update, a geotechnical investigation campaign should be conducted to confirm the quality and quantity (volumes) of available materials as well as the overburden thickness and the groundwater conditions. An assessment of the access road conditions should be carried out at the appropriate time to evaluate the extent of the rehabilitation work needed.

Finally, it must be noted that the location and 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

Données Québec, 2019-2020. LIDAR - Modèles numériques (terrain, canopée, pente).
<https://www.donneesquebec.ca/recherche/fr/dataset/produits-derives-de-base-du-lidar>

Gestim Plus, 2023. Gestion des titres miniers. Interactive map.
https://gestim.mines.gouv.qc.ca/MRN_GestimP_Presentation/ODM02201_menu_base.aspx

Gouvernement du Québec, Environment Quality Act, Regulation respecting sand pits and quarries (updated on August 1st 2022). <https://www.legisquebec.gouv.qc.ca/en/document/cr/Q-2,%20r.%207.1>

Hardy, L., 1977. Deglaciation, and Lacustrine and Marine Episodes on the Québec Portion of the James Bay Lowlands. *Géographie Physique et Quaternaire*, 31(3-4), 261-273.
<https://doi.org/10.7202/1000277ar>.

Hardy, L., 1982. Le Wisconsinien supérieur à l'est de la baie James (Québec). *Le Naturaliste canadien*, Vol. 109, pp. 331-351.

Ministère des Ressources naturelles et des Forêts du Québec (MRNFQ), 2023. Lexique stratigraphique.
https://gq.mines.gouv.qc.ca/lexique-stratigraphique/province-du-superieur_en/

Natural Resources Canada (NRCan), 2000. Canadian Digital Surface Model.
<https://open.canada.ca/data/en/dataset/768570f8-5761-498a-bd6a-315eb6cc023d>

Système d'information géominière du Québec (SIGÉOM), 2023. Interactive map.
https://sigeom.mines.gouv.qc.ca/signet/classes/I1108_afchCartelIntr

Société de développement de la Baie-James, 2022. Cahier des charges, Appel de propositions SD22-5033-1 pour la sélection d'une firme de professionnels dans les domaines de la géotechnique et de l'ingénierie des sols et des matériaux. Études géotechniques et de caractérisation des sources de matériaux granulaires le long de la route du Nord.



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.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Experts-conseils present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Experts-conseils is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

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 Summary Tables



Table B-1: Summary characteristics of potential borrow sources located along the Route du Nord

Site ID	Status	Centroid Coordinates		Area (ha)	No. SMS (lease expiration date) ¹	Claim (expiration date) ¹	Municipality	Landform Type	Material Type	Estimated Average Exploitable Thickness (m)	Potential Volume (m ³)	Site Description ²	Site Access	
		MTM zone	NAD 83 CSRS											
			Easting (m)											Northing (m)
GD-5	Existing	8	252 865	5 543 330	17.1	32J01-1 (2023/03/31)	Yes (2023/07/12 2024/12/29)	Chibougamau / Eeyou Ischee Baie-James	Undulating glaciofluvial deposit	Sand and gravel	6-8	500 000	The site is located southwest of KP 5, adjacent to an existing borrow pit. Apart from a logging road along its western side, the proposed borrow pit is forested and therefore forest clearing would be required. The Galloway Lake is located to the southeast of the site and a regulatory buffer (30 m) will need to be maintained between the lake and the borrow pit. The most favorable area has been delineated; however, the exploitable area could be increased if necessary.	The site is adjacent and accessible directly from the Route du Nord by the existing borrow pit.
GD-13	Existing	8	248 225	5 549 720	49.1	32J01-4 (Expired)	Yes (2023/08/20)	Eeyou Ischee Baie-James	Undulating glaciofluvial deposit and esker ridge	Sand and gravel	4	500 000	The site is adjacent to the road (west side) at KP 13. The landform consists of an esker ridge bordered with undulating glaciofluvial deposits. The deposit extends on both sides of the Route du Nord. Existing pits are present on each side of the road; however, available volumes appear more significant on the west side. The esker ridge is about 20 m above the surrounding terrains while the open faces within the existing pit are usually 4 m high. The site has been partially deforested on its southern boundary. The rest of the site appears to be densely forested. The extension of the site would be slightly limited by the presence of wetlands adjacent to the western half of the delineated site. Additionally, a ~35 m wide power line right of way (ROW) crosses the site following a north-south axis. Finally, a logging trail crosses the site in a southeast-northwest orientation. The respect of an adequate buffer distance between the ROW and the potential borrow source should be considered.	The site is adjacent and accessible directly from the Route du Nord by the existing borrow pit.
GD-28	Existing	8	245 785	5 563 300	8.8	32J01-6 (2023/03/31)	No	Eeyou Ischee Baie-James	Undulating juxtaglacial deposit	Sand and gravel	6	120 000	The site is adjacent to KP 28, on the east side. It is located between the Route du Nord and a power line ROW. The site was previously exploited on its southern border and appears to contain between 6 and 10 m thick of materials. Except for a 35 m wide corridor preserved along the road (on the west) and the ROW (on the east), the site does not seem to present any additional environmental constraints.	The site is adjacent and accessible from the Route du Nord by the existing access road
GD-45.5	Existing	8	243 280	5 579 450	7.8	32J08-2 (expired)	Yes (2025/11/06)	Eeyou Ischee Baie-James	Juxtaglacial ridge	Sand and gravel	3	100 000	The site is adjacent to the west of KP 45. The site consists of a juxtaglacial ridge of approximately 480 m long, between 130 and 150 m wide (7.8 ha), and about 10 m high. An existing pit has previously been exploited in the southeast section of the ridge. However, a significant volume of material is still available. The site is partially forested and would require some land clearing. A watercourse flows along the northwest boundary of the site where a 30 m buffer distance will have to be respected. It must be noted that a power line ROW is located at the eastern extremity of the site, thus a safe distance will need to be respected as well.	The site is accessible by the access road of the existing borrow pit.



Site ID	Status	Centroid Coordinates		Area (ha)	No. SMS (lease expiration date) ¹	Claim (expiration date) ¹	Municipality	Landform Type	Material Type	Estimated Average Exploitable Thickness (m)	Potential Volume (m ³)	Site Description ²	Site Access	
		MTM zone	NAD 83 CSRS											
			Easting (m)											Northing (m)
GD-78.6	Existing	8	228 365	5 605 990	5.2	32J10-8 (2023/03/31)	Yes (2025/10/15)	Eeyou Ischee Baie-James	Esker ridge	Sand and gravel	5	80 000	The site is located approximately 420 m east of KP 78.6. The delineated landform consists of an esker ridge of about 635 m long, between 50 and 100 m wide, and about 15 to 20 m high. An existing borrow pit was previously exploited between the Route du Nord and the delineated site. However, significant residual volumes still seem to be available. The southwestern half of the site was partially cleared, while the northeast half is fully vegetated. A lake is located near the northeast section of the site where a 30 m buffer will have to be respected.	The site is accessible using the access road of the existing borrow pit.
GD116-.3	Existing	8	202 940	5 624 350	5.6	32J10-9 (2023/03/31)	Yes (2023/06/12 2024/08/05)	Eeyou Ischee Baie-James	Esker ridge	Sand and gravel	5	75 000	The site is located approximately 350 north of KP 116.3. The delineated landform consists of an esker ridge of about 750 m long, between 50 and 100 m wide, and about 10 to 15 m high. An existing borrow pit was previously exploited between the Route du Nord and the delineated site. However, significant residual volumes still seem to be available. Apart from a small trail crossing the site from the southwest to the northeast, it is densely forested. A small pond is located on the east side of the central portion of the site where a 30 m buffer distance will have to be respected.	The site is accessible using the access road of the existing borrow pit.
GD-125.1	Existing	9	406 440	5 622 175	29.1	32J11-3 (Expired)	Yes (2024/12/23)	Eeyou Ischee Baie-James	Esker ridge and undulating glaciofluvial deposit	Sand and gravel	3	250 000	The site is located north of KP 125.1. The delineated landform consists of an esker ridge of about 1455 m long, 60 m wide, and about 5 to 10 m high, bordered on each side by undulating glaciofluvial deposits. The esker ridge was partially exploited within the delineated site along an approximately 600 m long corridor. The site is mostly vegetated and surrounded by wetlands. A river also flows on the northwestern extremity of the site. Consequently, some buffer zones would have to be respected due to the presence of these environmental constraints.	The site is accessible using the access road of the existing borrow pit.
GD-139.7	New	9	396 830	5 631 220	10.7	-	No	Eeyou Ischee Baie-James	Esker ridge	Sand and gravel	5	175 000	The site is located approximately 1450 m southwest of KP 139.7. The delineated landform consists of an esker ridge of about 1000 m long, about 70 to 160 m wide and about 10 to 12 m high. The site is densely forested and has not yet been exploited. Two other esker ridges are located closer to the Route du Nord, but their exploitation would be significantly limited due to their proximity to wetlands, watercourses, and waterbodies. No environmental constraints are in the vicinity of the delineated site.	The site is accessible through an existing logging trail of approximately 1.4 km long.
GD-176	Existing	9	394 535	5 665 430	5.4	32O03-24 (2023/03/31)	No	Eeyou Ischee Baie-James	Juxtaglacial Lanform (Sakami Moraine)	Sand	4	50 000	The site is located approximately 300 m west of KP 176. The delineated landform has an irregular shape with a maximum length of about 460 m long, about 70 to 160 m wide and about 10 to 12 m high. An existing borrow pit was previously mined next to a logging trail where the material thickness is estimated to 10 m in the highest sector of the deposit. The site is forested and bordered by a wetland and a small pond on the west side. In addition to these environmental constraints, the exploitation of materials would also be limited by the presence of a power line ROW along the east side of the site. Nevertheless, a significant material volume remains available for exploitation.	The site is accessible using the access road of the existing borrow pit.



Site ID	Status	Centroid Coordinates			Area (ha)	No. SMS (lease expiration date) ¹	Claim (expiration date) ¹	Municipality	Landform Type	Material Type	Estimated Average Exploitable Thickness (m)	Potential Volume (m ³)	Site Description ²	Site Access
		MTM zone	NAD 83 CSRS											
			Easting (m)	Northing (m)										
GD-289.4	Existing	9	338 740	5 726 230	8.5	32N09-13 (2023/03/31)	Yes (2025/10/30)	Eeyou Ischee Baie-James	Glaciofluvial terrace	Sand	2	80 000	The site is located approximately 3.4 km south of KP 289.4, along an existing road leading to the Rupert River. The deposit has a maximum length of about 660 m and a maximum width of about 205 m. An existing borrow pit was previously exploited in this area, but a significant volume of material still seems to remain. The site is relatively flat and forested. A watercourse flows eastward along the south boundary of the site, but its presence should not significantly affect the potentially exploitable volume.	The site is accessible using the existing gravel road leading to the Rupert River. At 3.4 km south of the Route du Nord, the delineated site is accessible by the existing borrow pit.
GD-312	Existing	9	318 120	5 720 830	24.9	32N09-26 (2023/03/31)	No	Eeyou Ischee Baie-James	Juxtaglacial and proglacial subaquatic landform	Sand	2	150 000	The site is located approximately 800 m north of KP 312. The delineated site has a maximum length of 945 m and a maximum width of 300 m. The surface of the site is flat and forested. An existing borrow pit was previously exploited at this location, however, the materials seem to be relatively thin, and the water table is expected to be reached at a shallow depth. Nevertheless, given the size of the site, the potential volume that could be extracted remains significant. Different wetlands and waterbodies are present around the potential site; therefore a 30 m wide buffer would have to be respected.	The site is accessible using the access road of the existing borrow pit.

¹ Source: Gestim Plus, 2023

² Notes: all kilometer posts (KP) refer to locations along the Route du Nord.



Table B2: Summary characteristics of the delineated potential quarry sites located along the Route du Nord

Site ID	Status	Centroid Coordinates			Area (ha)	No. SMS (lease expiration date) ¹	Claim (expiration date) ¹	Municipality	Landform Type	Material Type ²	Estimated Average Exploitable Thickness (m)	Potential Volume (m ³)	Potential volume considering a swell factor of 1.15 (once compacted)	Site Description ³	Site Access
		MTM zone	NAD 83 CSRS												
			Easting (m)	Northing (m)											
Q-38.2	New	8	245 690	5 572 560	3.0	-	Yes (2025/06/18)	Eeyou Ischee Baie-James	Northeast/southwest oriented bedrock hill	Bedrock (Felsic intrusive rocks, granite to diorite and gneiss)	6	120 000	138 000	The site is located approximately 65 m northeast of an existing pit adjacent to KP 38.2. The delineated area occupies an area of approximately 3 ha and rises approximately 6 m above the surrounding terrain. If necessary, the area could be expanded northward towards Lake Maaskituu. Its surface is sparsely vegetated and comprises a thin overburden cover. Numerous large, scattered boulders are visible on the surface. No apparent constraints related to streams, waterbodies, or wetlands.	A short access road of approximately 65 m long should be constructed from the existing borrow pit, which is directly adjacent to the Route du Nord.
Q-97.5	New	8	217 075	5 619 060	7.7	-	Yes (2023/06/12) 2025/01/22	Eeyou Ischee Baie-James	Top of a rounded rocky hill	Bedrock (Gabbro, tuf, magnesian basalt, basalt)	10	200 000	230 000	The site is located approximately 720 m northeast of KP 97.5. It consists of a rounded hill with an area of approximately 7.7 ha. The top of this hill rises approximately 20 m above the surrounding terrains. The area has been logged and therefore has no tree cover. No apparent constraints related to streams, waterbodies, or wetlands.	The exploitation of the site would require the construction of an access road of approximately 250 m long from an existing logging trail which connects to the Route du Nord at the KP 97.5.
Q-104.6	New	8	210 930	5 622 610	7.8	-	Yes (2024/08/05)	Eeyou Ischee Baie-James	Top of a rounded rocky hill	Bedrock (Magnesian basalt and basalt)	10	300 000	345 000	The site is located approximately 500 m west of KP 104.6. It consists of a rounded hill with an approximate area of 7.8 ha. The top of the hill rises approximately 15 m above the surrounding terrains. The area has not yet been exploited, is sparsely vegetated, and the rocky hill seems to have little or no overburden cover. No apparent constraints related to streams, waterbodies, or wetlands.	The exploitation of the site would require the construction of an access road of approximately 500 m from KP 104.6
Q-200.6	New	9	378 170	5 681 800	6.0	-	No	Eeyou Ischee Baie-James	Rounded rocky hill	Bedrock (Gneiss and granitoids and migmatized diorite)	10	250 000	287 500	The site is located approximately 600 m southwest of KP 200.6. It consists of an unexploited rounded rocky hill with an approximate area of 6.0 ha. The top of the hill rises approximately 10 m above the surrounding terrains. The site is adjacent to an existing borrow pit that would allow the quarry to be mined from its north or west face. No apparent constraints related to streams, waterbodies, or wetlands.	The site could be accessed by the former access road leading to the borrow pit (on the northwest) or by building a new ~130 m long access road from the northeastern mined area. In any case, the former access road crosses the power line and will have to be rehabilitated to allow the exploitation of the site.
Q-237.2	Existing	9	377 685	5 710 880	2.9	32O11-14 (Expired)	No	Eeyou Ischee Baie-James	Lateral slope of a rounded rocky hill	Bedrock (Gneiss and granitoids and migmatized diorite)	10	500 000	575 000	The site is located approximately 250 m east of KP 237.2, and about 200 m south of the Rupert River. An existing quarry was exploited at this location over an area of 40 m long by 40 m wide. The existing open face is approximately 6 m high. The area is sparsely vegetated, and the site is covered by a thin layer of overburden. No apparent constraints related to streams, waterbodies, or wetlands.	The site could be accessed by the former access road leading to the existing quarry. Rehabilitation works of the access road could be required to allow the exploitation of the site.



Site ID	Status	Centroid Coordinates			Area (ha)	No. SMS (lease expiration date) ¹	Claim (expiration date) ¹	Municipality	Landform Type	Material Type ²	Estimated Average Exploitable Thickness (m)	Potential Volume (m ³)	Potential volume considering a swell factor of 1.15 (once compacted)	Site Description ³	Site Access
		MTM zone	NAD 83 CSRS												
			Easting (m)	Northing (m)											
Q-344.1	Existing	9	291 070	5 720 320	8.6	32N10-1 (Expired)	Yes (2023/10/23)	Eeyou Ischee Baie-James	Rounded rocky hill	Bedrock (Biotite granite)	10	300 000	345 000	The site is located approximately 200 m north of KP 344.1. An existing quarry with an area of 60 m long by 60 m wide was previously exploited. The main open face is approximately 10 m high. The surface of the rocky hill is sparsely vegetated and covered by a thin overburden layer. Considerations should be given to a watercourse flowing along the north side of the hill.	The site could be accessed using the existing 600 m long access road.
Q-386.2	New	9	256 405	5 711 970	7.3	32N11-5 (Expired)	Yes (2025/03/09 2025/03/02)	Eeyou Ischee Baie-James	Rounded rocky hill	Bedrock (Porphyritic granodiorite)	10	400 000	360 000	The site is located approximately 400 m north of KP 386.2. An existing borrow pit was previously exploited along the road, while the potential quarry site is located approximately 200 m north of this pit. The site stands at about 20 m above the surrounding terrains and approximately 10 m above the existing pit. The site is generally not vegetated, and the overburden cover is almost absent. A watercourse flows approximately 60 m north the site but would not affect the exploitable volume of materials.	The site would require the construction of an access road about 400 m long across the existing pit to the bottom of the exposed bedrock.
Q-389.5	Existing	9	254 355	5 709 270	1.9	-	No	Eeyou Ischee Baie-James	Rounded rocky hill	Bedrock (Porphyritic granodiorite)	10	80 000	92 000	The site is directly adjacent to the Route du Nord, south of KP 389.5. An existing quarry was previously mined at this location over an area of about 100 m long by 40 m wide. The rocky hill stands approximately 15 m above the surrounding terrains while the open face was excavated to about 10 m high. The bedrock is generally exposed or covered by a thin overburden layer. Considerations should be given to a small watercourse located approximately 30 m southeast from the site.	The site is adjacent and accessible directly from the Route du Nord by the existing pit.

¹ Source: Gestim Plus, 2023

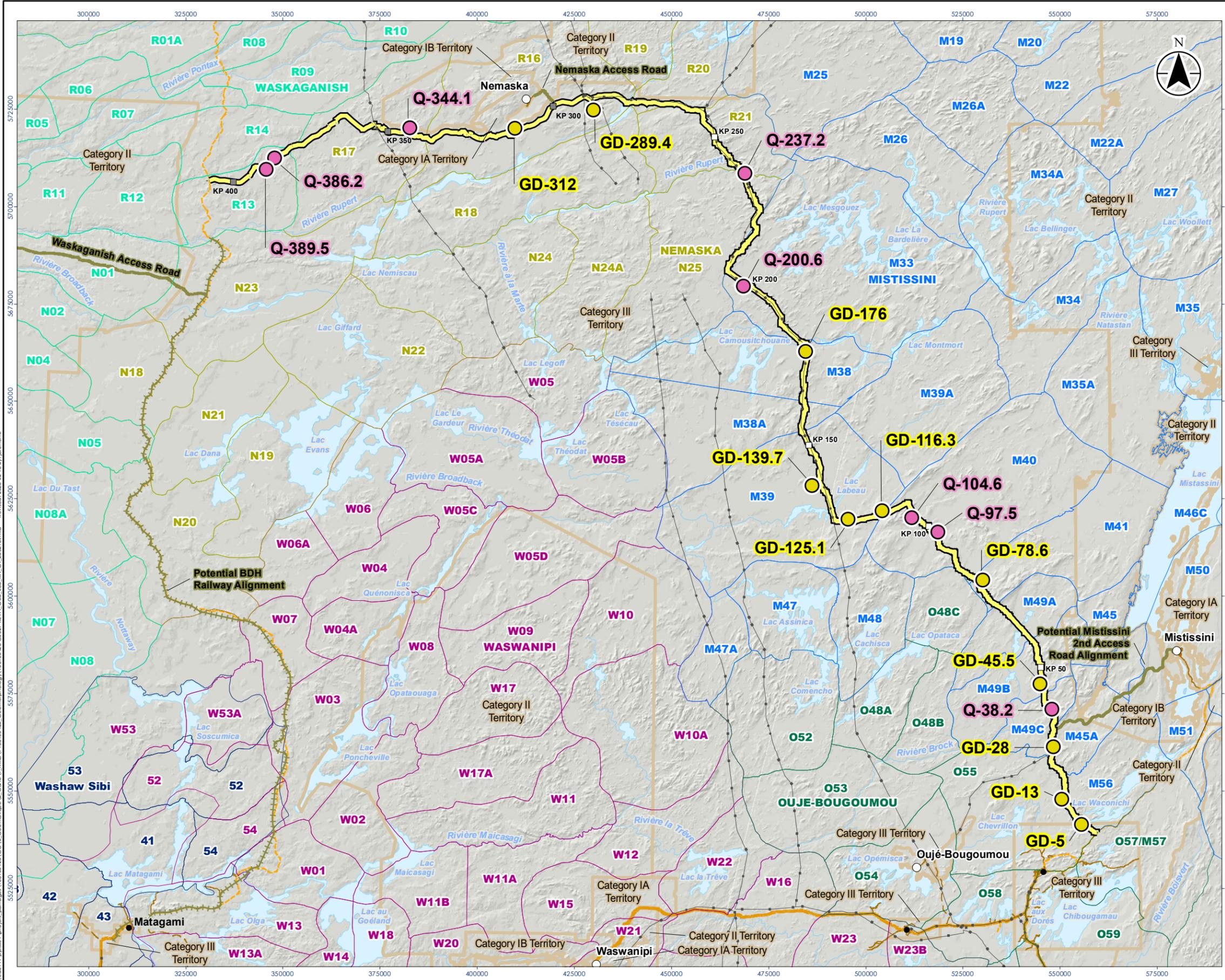
² Bedrock lithology source: SIGÉOM, 2023.

³ Notes: all kilometer post (KP) refer to locations along the Route du Nord.



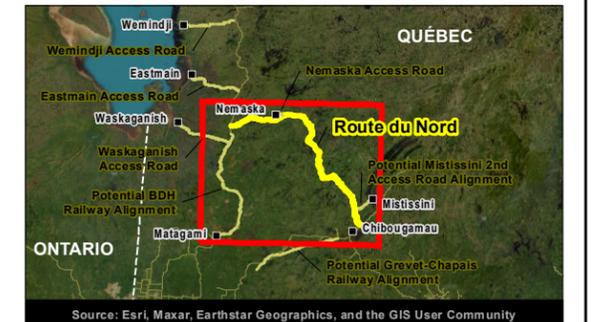
Appendix C Figures





Map No. **C1**
 Title **Potential Borrow Sources and Quarry Sites Route du Nord**
 Client/Project Cree Development Corporation
 La Grande Alliance – Feasibility Study
 Phase 1
 Project Location 158100425-C0007 REVA
 Eeyou Itchee, Québec Prepared by Julie Brunette on 2023-02-18
 Verified by E. Ferland on 2023-02-18
 Independent Review by F. Vinet on 2023-02-18

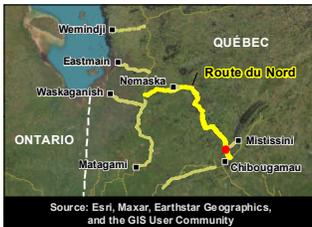
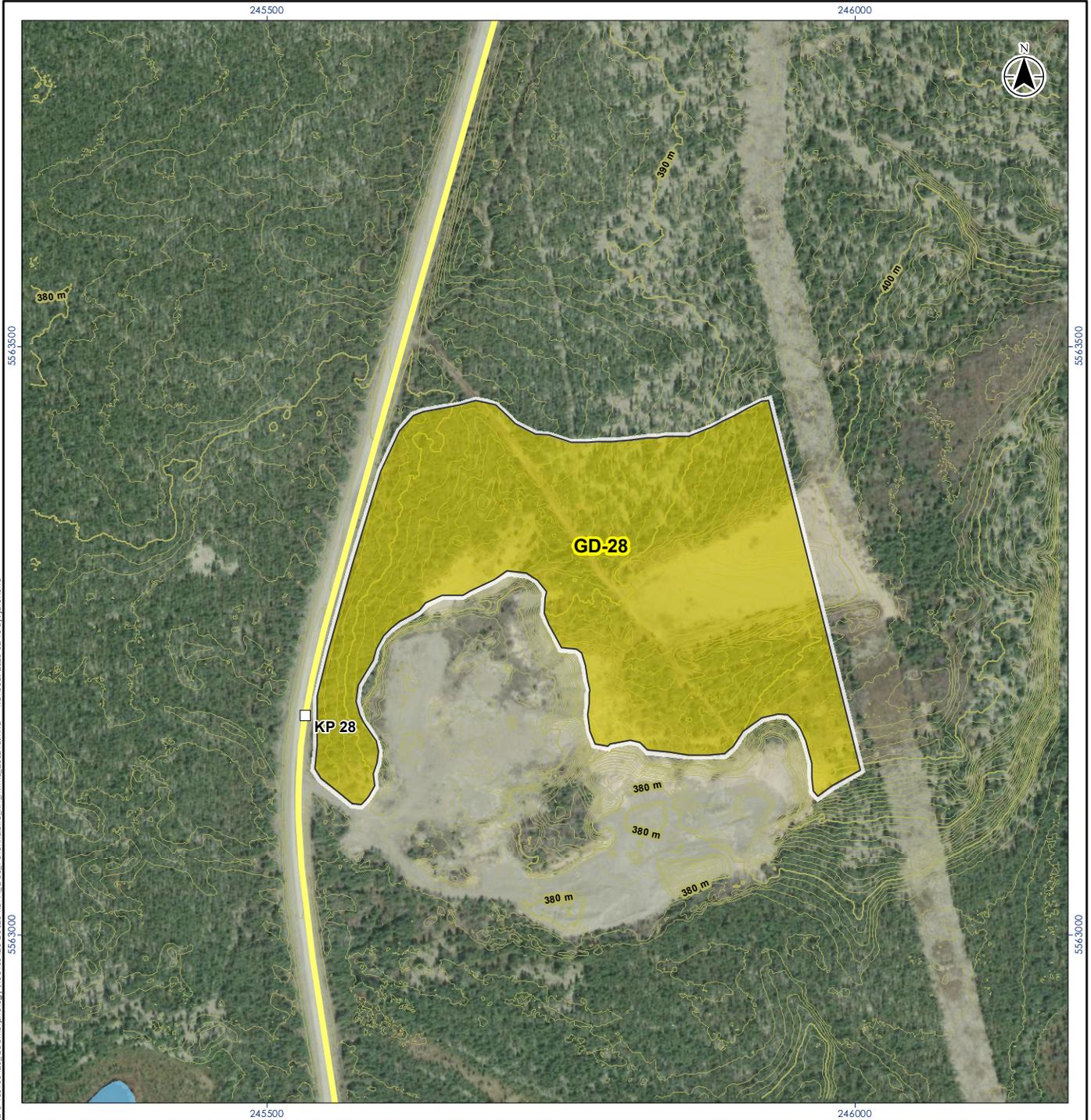
- | | |
|--|---|
| Human Environment Components | Hydrography |
| ○ Cree Village | ■ Body of Water |
| ● Locality | — Watercourse |
| □ Category I, II or III Territory | Road Network |
| — Power Line | □ Kilometric Point (MTQ, 2021) |
| Study Component | ■ Kilometric Point (Created by Stantec) |
| — Route du Nord | Road Classification |
| — Access Road | — National/Regional |
| Projected Component | — Collector |
| — Potential BDH Railway Alignment | — Local |
| Potential Material Source | — Access Path |
| ● Potential Borrow Source (GD) | |
| ● Potential Quarry Site (Q) | |
| Trapline Limit and Community Name | |
| □ Eastmain | |
| □ Mistissini | |
| □ Nemaska | |
| □ Oujé-Bougoumou | |
| □ Washaw Sibi | |
| □ Waskaganish | |
| □ Waswanipi | |



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 18N
 2. Potential Material Source: Stantec, 2023
 3. Road Network: Adresses Québec, 2021
 4. Hydrography: GRHQ, 2017
 5. Orthomogery: ESRI-World Imagery, 2012 to 2021

0 10 20 km
 1:1 000 000
 (At original document size of 11x17)

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Vision Eeyou Itchee has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Vision Eeyou Itchee assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



Study Component

Route du Nord

Geotechnical Investigation

Potential Borrow Source (GD)

Road Network

Kilometric Point (MTQ, 2021)

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 2023-02-18
 Technical Review by E. Ferland on 2023-02-18
 Independent Review by F. Vinet on 2023-02-18

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

Map No. C4

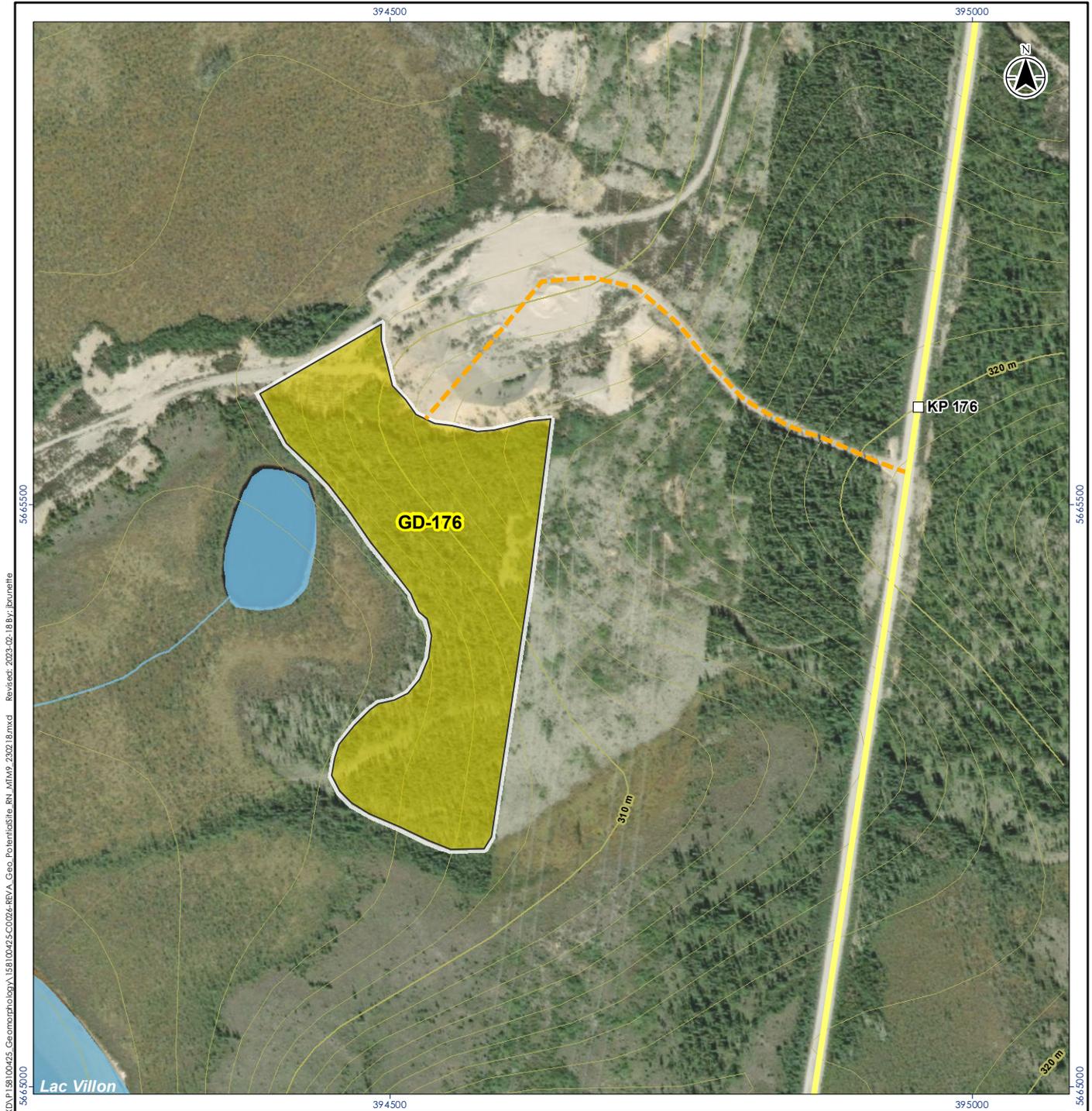
Title: Potential Borrow Source GD-28

- Notes**
1. Coordinate System: NAD 1983 UTM Zone 18N
 2. Geotechnical Investigation and Projected Component: Stantec, 2023
 3. Road Network: Adresses Québec, 2021
 4. Hydrography: GRHQ, 2017
 5. Topography: Forêt Ouverte, 2023
 6. Orthomogery: ESR-World Imagery, 2012 to 2021



\\c00119\ppl\ssd\p\proj\p\pot\p\gd-28\158100425-C0008-REV A_Geo_PotentialBor_Src_RH_MTM8_2023_18.mxd Reviewed: 2023-02-18 By: jbrunette

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



\\cadd119\proj\01\proj\01\00425\GD-176_Geomorphology\158100425-C008-REVA_Geo_PotentialSite_RN_MTPP_2023-02-18 By J.Bruneffe



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 18N
 2. Geotechnical Investigation and Projected Component: Stantec, 2023
 3. Road Network: Adresses Québec, 2021
 4. Hydrography: GRHQ, 2017
 5. Topography: Forêt Ouverte, 2023
 6. Orthomogery: ESR-World Imagery, 2012 to 2021

- Proposed Access Road**
- Route du Nord
 - Proposed Access Road
- Geotechnical Investigation**
- Potential Borrow Source (GD)
- Road Network**
- Kilometric Point (MTQ, 2021)
- Hydrography**
- Body of Water
 - Watercourse
- Topography**
- Contour line (1 m)
 - Primary
 - Secondary

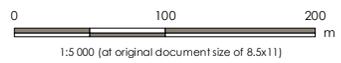


Project Location: 158100425-C008 REVA
 Prepared by J. Bruneffe on 2023-02-18
 Technical Review by E. Ferland on 2023-02-18
 Independent Review by F. Vinet on 2023-02-18

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

Map No.: **C10**

Title: **Potential Borrow Source GD-176**



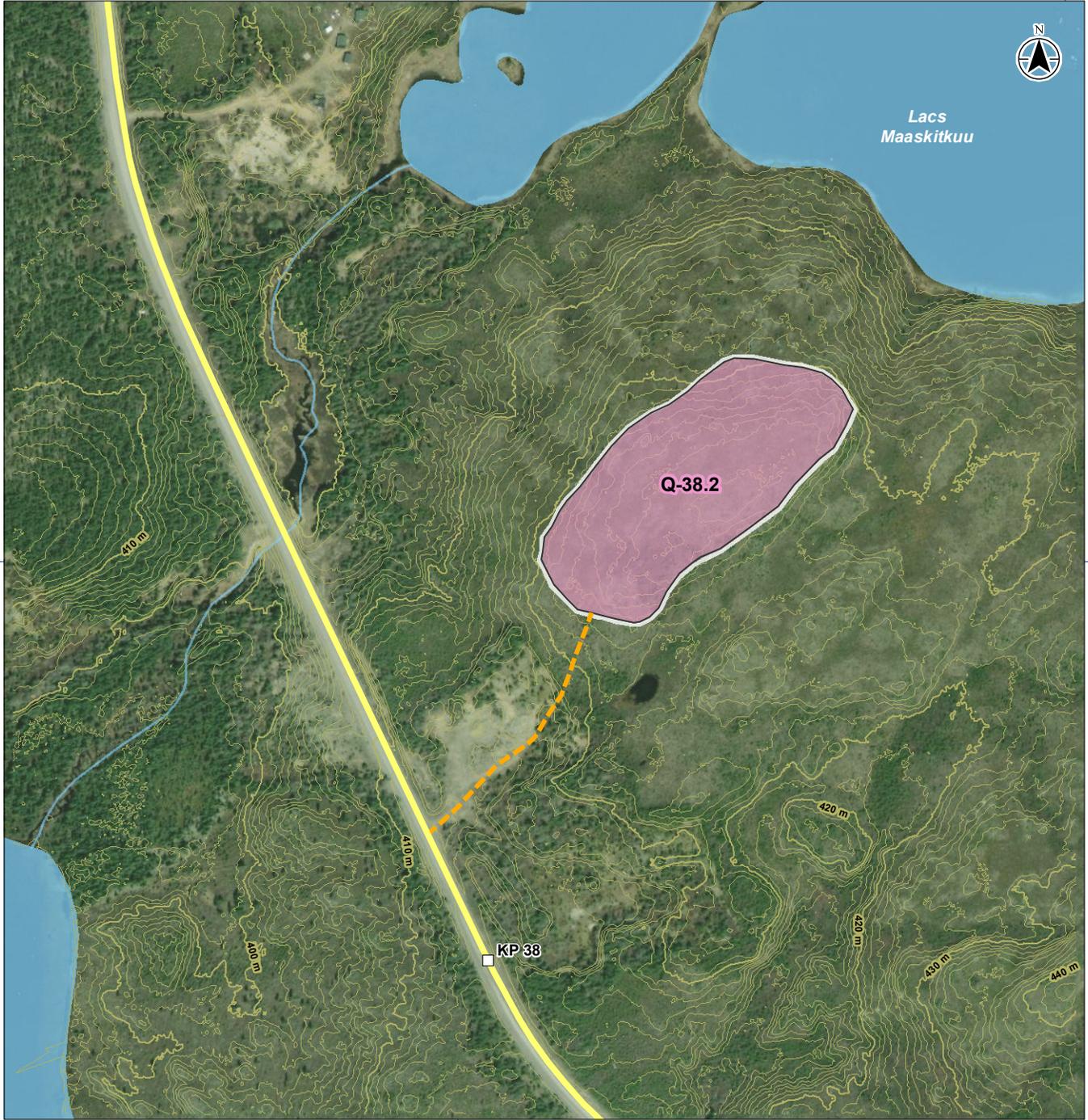
Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

245500

246000



Lacs
Maaskitkuu



5572500

5572500

\\ced0119-ppl60\ppl60\projets_potagers\158100425-Geo\Geomatics\2_Carto\1_MXD\158100425-Geo\Geomatics\158100425-C008-REV A_Geo_Potager\Site_RH_MTM8_2021_18.mxd Reviewed: 2023-02-18 By: jbrunette

245500

246000



- Study Component**
- Route du Nord
- Projected Component**
- Proposed Access Road
- Geotechnical Investigation**
- Potential Quarry Site (Q)
- Road Network**
- Kilometric Point (MTQ, 2021)

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



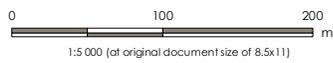
Project Location: 158100425-C008 REV A
 Eeyou Itchee, Québec
 Prepared by J. Brunette on 2023-02-18
 Technical Review by E. Ferland on 2023-02-18
 Independent Review by F. Vinet on 2023-02-18

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

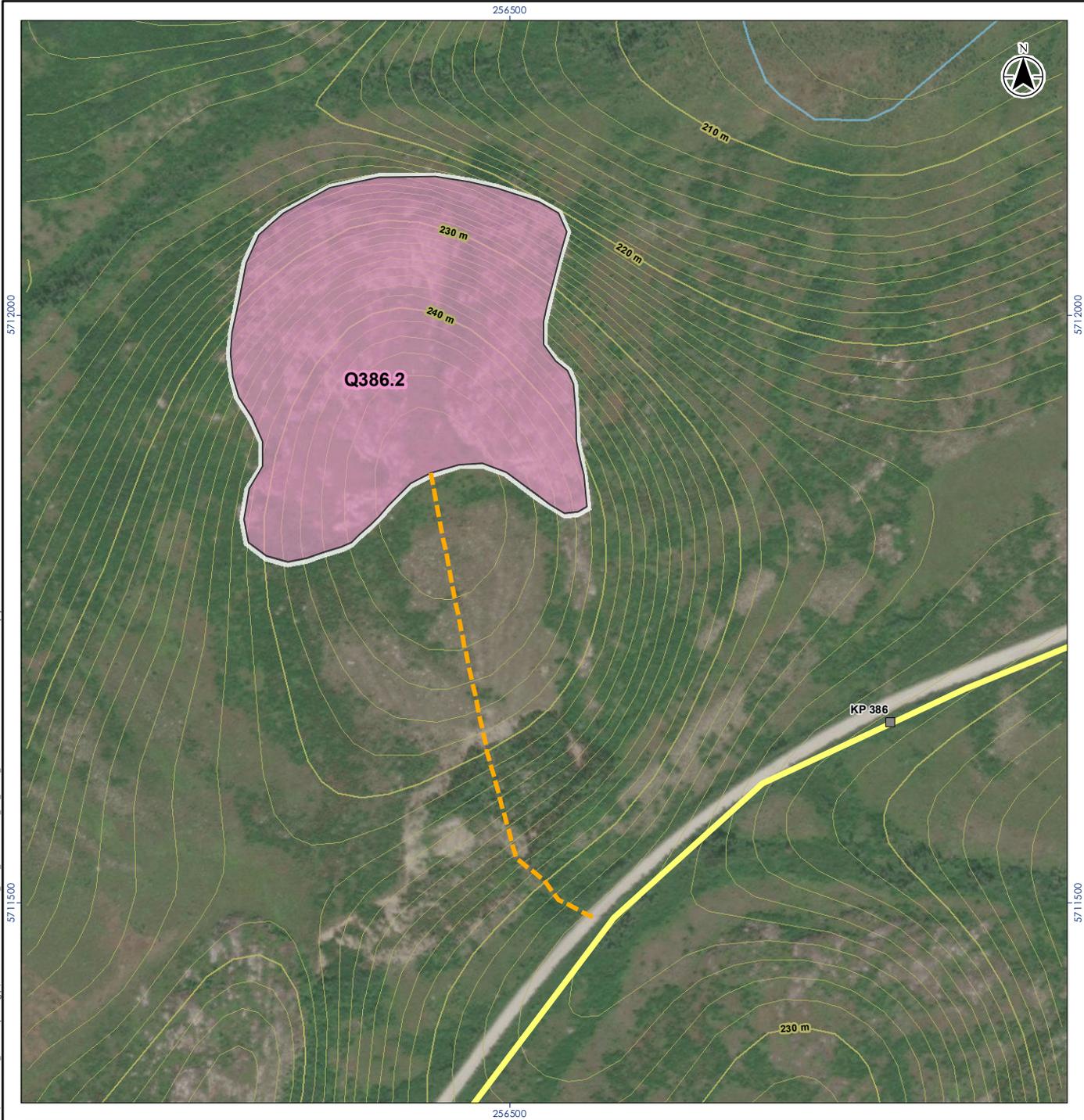
Map No.: C13

Title: Potential Quarry Site Q-38.2

- Notes**
1. Coordinate System: NAD 1983 UTM Zone 18N
 2. Geotechnical Investigation and Projected Component: Stantec, 2023
 3. Road Network: Adresses Québec, 2021
 4. Hydrography: GRHQ, 2017
 5. Topography: Forêt Ouverte, 2023
 6. Orthomogery: ESR-World Imagery, 2012 to 2021



Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



- Proposed Access Road**
- Route du Nord
 - Proposed Access Road
- Geotechnical Investigation**
- Potential Quarry Site (Q)
- Road Network**
- Kilometric Point (Created by Stantec)

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

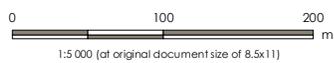


Project Location: 158100425-C0008 REVA
 Prepared by J. Bruneffe on 2023-02-18
 Technical Review by E. Ferland on 2023-02-18
 Independent Review by F. Vinet on 2023-02-18

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

Map No.
C19

Title
Potential Quarry Site Q-386.2



\\c00119\p0160\1\proj\p0160\158100425-C0008-REVA_Geo_PotentialQuarry_Site_RU_MTP_2023-02-18_Vj_brunette

5712000

5711500

5712000

5711500

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



\\cdo119-ppf60\projets_pdr\pdr\158100425-C008-REV1-MXD\FI_158100425-Geo\158100425-Geo\158100425-C008-REV1-Geo_PotentialSite_RH_MFMP_2023-02-18_ByJ.Bruneffe



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 18N
 2. Geotechnical Investigation and Projected Component: Stantec, 2023
 3. Road Network: Adresses Québec, 2021
 4. Hydrography: GRHQ, 2017
 5. Topography: Forêt Ouverte, 2023
 6. Orthomogry: ESRI-World Imagery, 2012 to 2021

- Proposed Access Road**
- Route du Nord
- Geotechnical Investigation**
- Potential Quarry Site (Q)
- Road Network**
- Kilometric Point (Created by Stantec)
- Hydrography**
- Body of Water
- Watercourse
- Topography**
- Contour line (1 m)
- Primary
- Secondary

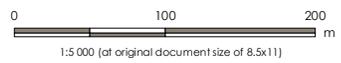


Project Location: 158100425-C008 REV1
 Prepared by J. Bruneffe on 2023-02-18
 Eeyou Itchee, Québec
 Technical Review by E. Ferland on 2023-02-18
 Independent Review by F. Vinet on 2023-02-18

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

Map No.
C20
 Title

Potential Quarry Site Q-389.5



Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

Appendix D Sites identified by the SDBJ



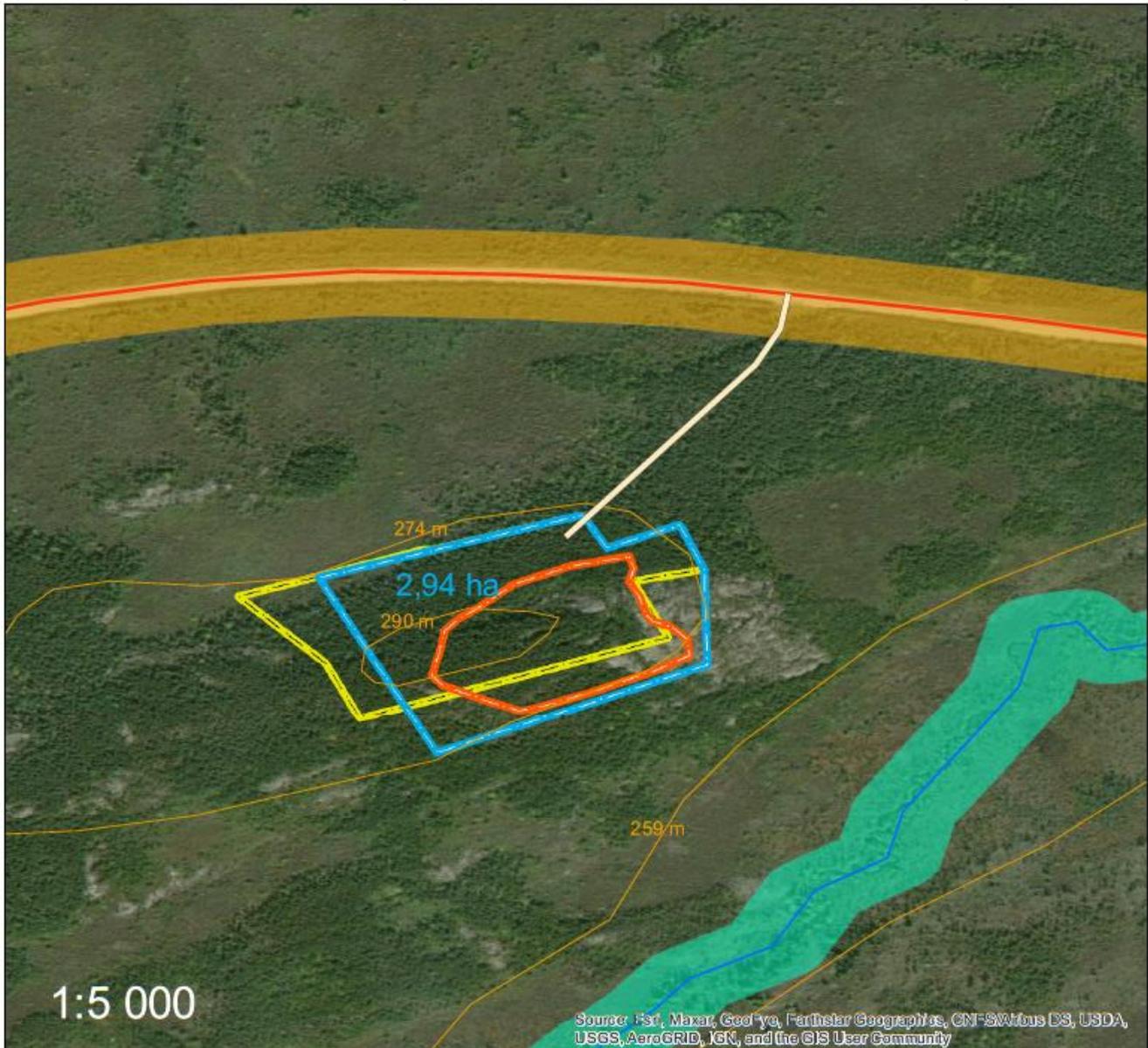
Annexe A : Synthèse de la configuration des sites à explorer

N° site	km	Désignation	Superficie	Description	Photo
32N11-5 #11	396	Carrière	2.91 ha	<p>Il n'y a aucun chemin menant à ce site. Ce cran rocheux se retrouve à 100 m de la route du Nord. Il fait environ 7 m de hauteur, est d'une largeur approximative de 100 m et d'une longueur de 150 m. Une estimation des pentes des versants du cran n'a pas pu être déterminée.</p> <p>Il est composé de roche ignée (granitoïde, probablement de la granodiorite) et ce site représente un potentiel d'exploitation d'une future carrière. Toutefois, aucun forage n'a été positionné sur ce site, car une mesure des pentes du cran rocheux serait nécessaire afin de valider l'accessibilité pour des forages géotechniques. Un volume jusqu'à environ 145 000 m³ pourrait être exploité.</p>	
32N11-4 (site #16)	371	Banc d'emprunt	4.09 ha (SDBJ)	<p>Ce site présente un potentiel de banc d'emprunt. Il est accessible par un chemin non entretenu (présence d'aulnes) à partir de la route du Nord.</p> <p>À l'est de l'entrée du site, on retrouve le potentiel de banc d'emprunt qui est composé de gravier avec du sable, des cailloux sub-anguleux et des blocs. Il fait environ 2,5 m de hauteur, est d'une largeur approximative de 60 m et d'une longueur de 75 m. Un volume estimé de 11 000 m³ de dépôt meuble pourrait être exploité.</p>	
32N10-1 (site #25)	344.6	Banc d'emprunt	2.85 ha (SDBJ)	<p>Ce site inclut un potentiel d'exploitation d'un banc d'emprunt. Il est accessible par un chemin existant à partir de la route du Nord.</p> <p>Le potentiel banc d'emprunt de ce site se retrouve à l'entrée, soit à 30 m de la route du Nord. Ce banc est composé de sable fin à moyen, traces de gravier et de cailloux avec présence de quelques blocs. Il fait environ 2,5 m de haut, est d'une largeur de 45 m pour une longueur de 115 m. Un volume estimé de 12 900 m³ pourrait être exploité.</p>	

N° site	km	Désignation	Superficie	Description	Photo
#27	340	Banc d'emprunt	8.14 ha	<p>Ce site est accessible par un chemin existant à partir de la route du Nord. Cet ancien site a une superficie déjà exploitée d'environ 3 ha.</p> <p>Ce banc d'emprunt potentiel est composé de gravier sablonneux. Il fait environ 3 m de hauteur pour une largeur de 30 m. Un volume estimé de 12 000 m³ pourrait être exploité ici. Ce volume reste à être confirmé selon les sondages géotechniques qui seront réalisés.</p>	
32N09-14 (site #31)	323	Carrière	9.56 ha	<p>Ce site est accessible par un chemin existant à partir de la route du Nord. Les parois de la carrière ont environ 5 à 6 m de hauteur, 146 m de longueur et 53 m de largeur. Le site est composé de roche ignée (granitoïde, probablement de la granodiorite). Un volume de 47 200 m³ pourrait être exploité ici.</p>	
32N09-28	297	Carrière	2.94 ha	<p>Ce site est accessible par un chemin existant à partir de la route du Nord. Les parois ont environ 7-10 m de hauteur. Il est composé de roche ignée (granitoïde, probablement du granite).</p>	
#35	293	Carrière	9.08 ha	<p>Il n'y a aucun chemin menant à ce site. Ce cran rocheux se retrouve à 50 m de la route du Nord. Il fait environ 20-25 m de hauteur pour 450 m de largeur, approximativement. Une estimation des pentes des versants du cran n'a pas pu être déterminée.</p> <p>Il est composé de roche ignée (granitoïde, probablement de la granodiorite) présentant un potentiel pour une carrière. Aucun forage n'a été positionné sur ce site, car une mesure des pentes du cran rocheux serait nécessaire afin de valider l'accessibilité pour des forages géotechniques.</p> <p>De plus, la couverture boisée empêchait une prise de vue de qualité nécessaire afin de sélectionner les endroits adaptés pour implanter des forages. Un volume de 400 000 m³ pourrait être exploité ici.</p>	

N° site	km	Désignation	Superficie	Description	Photo
#38	Km 1.2 Ch. Eastmain	Banc d'emprunt	2.9 ha	<p>Ce site est accessible par un chemin existant à partir de la route de Eastmain 1. La zone exploitable est localisée à 30 m au sud d'une ancienne zone d'exploitation, déjà au-delà de 10 ha. Il serait requis de vérifier si cette zone pourrait être une entité séparée de celle anciennement exploitée.</p> <p>Ce banc d'emprunt potentiel est composé de gravier avec un peu de cailloux et un peu de sable. Il fait environ 7 à 9 m de hauteur, 80 m de largeur pour 225 m de longueur. Un volume estimé de 160 000 m³ pourrait être exploité.</p>	
#60	287.8	Banc d'emprunt	2.9 ha	<p>Ce site se situe du côté sud de la Route-du-Nord et tout juste à l'ouest de l'intersection d'un chemin menant à un site d'enfouissement. Initialement, on avait localisé le site potentiel à la jonction des deux chemins, en respectant une zone d'exclusion de 35 mètres à partir de chacun des deux chemins. Or il y a une contrainte à l'exploitation plus large qui suit le chemin menant au site d'enfouissement et on a dû déplacer le site potentiel vers l'ouest pour respecter cette contrainte. Selon SIGÉOM, on y retrouve un dépôt juxtaglaciaire (Gx).</p>	
#04	260	Banc d'emprunt	2.74 ha	<p>Le matériel est composé de sable grossier avec cailloux.</p>	
32012-25 (site #53)	244	Banc d'emprunt	7.59 ha	<p>Ce site est accessible par un chemin existant (entretenu par Hydro Québec) à 1,5 km à partir de la route du Nord. Ce potentiel banc d'emprunt est composé de gravier avec cailloux arrondis. Il fait environ 2 m de hauteur, 66 m de largeur pour 125 m de longueur. Un volume estimé de 16 500 m³ pourrait être exploité.</p>	

Carrière Route-du-Nord 32N09-28 (sud aéroport de Némiscau)



Légende

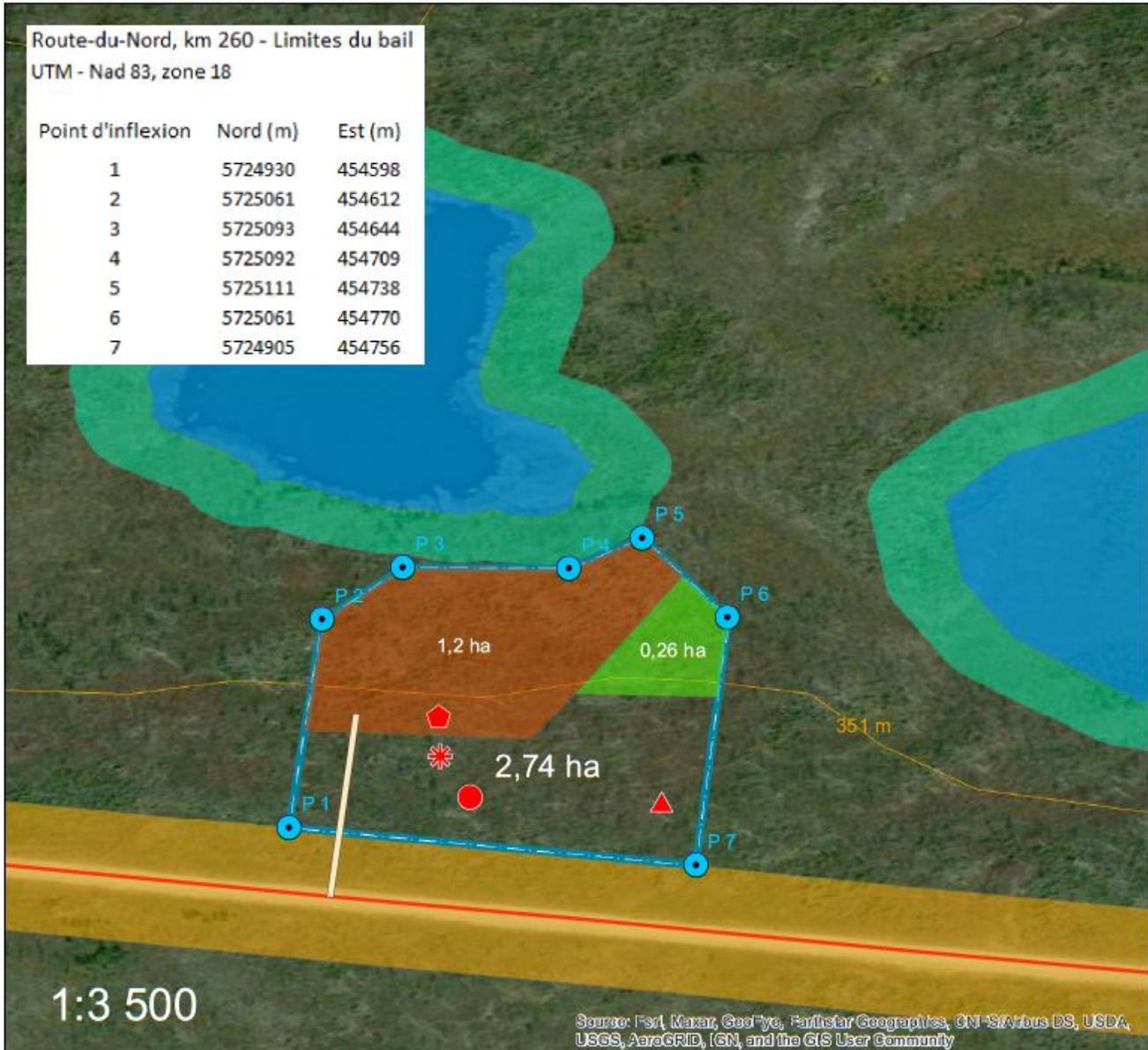
- | | | | |
|---|------------------------|---|------------------------|
|  | Nouveau site |  | Cours d'eau local |
|  | Site existant |  | Exclusion de 30 mètres |
|  | Partie exploitée |  | Topographie locale |
|  | Route du Nord | | |
|  | Chemins d'accès | | |
|  | Exclusion de 40 mètres | | |

Société de développement de la Baie-James

Analyse environnementale
d'une carrière pour ré-ouverture

Cartographie préparée par
Martin Fillion, ing. f.
le 7 février 2022

Gravière Route-du-Nord Site #004, km 260



Légende

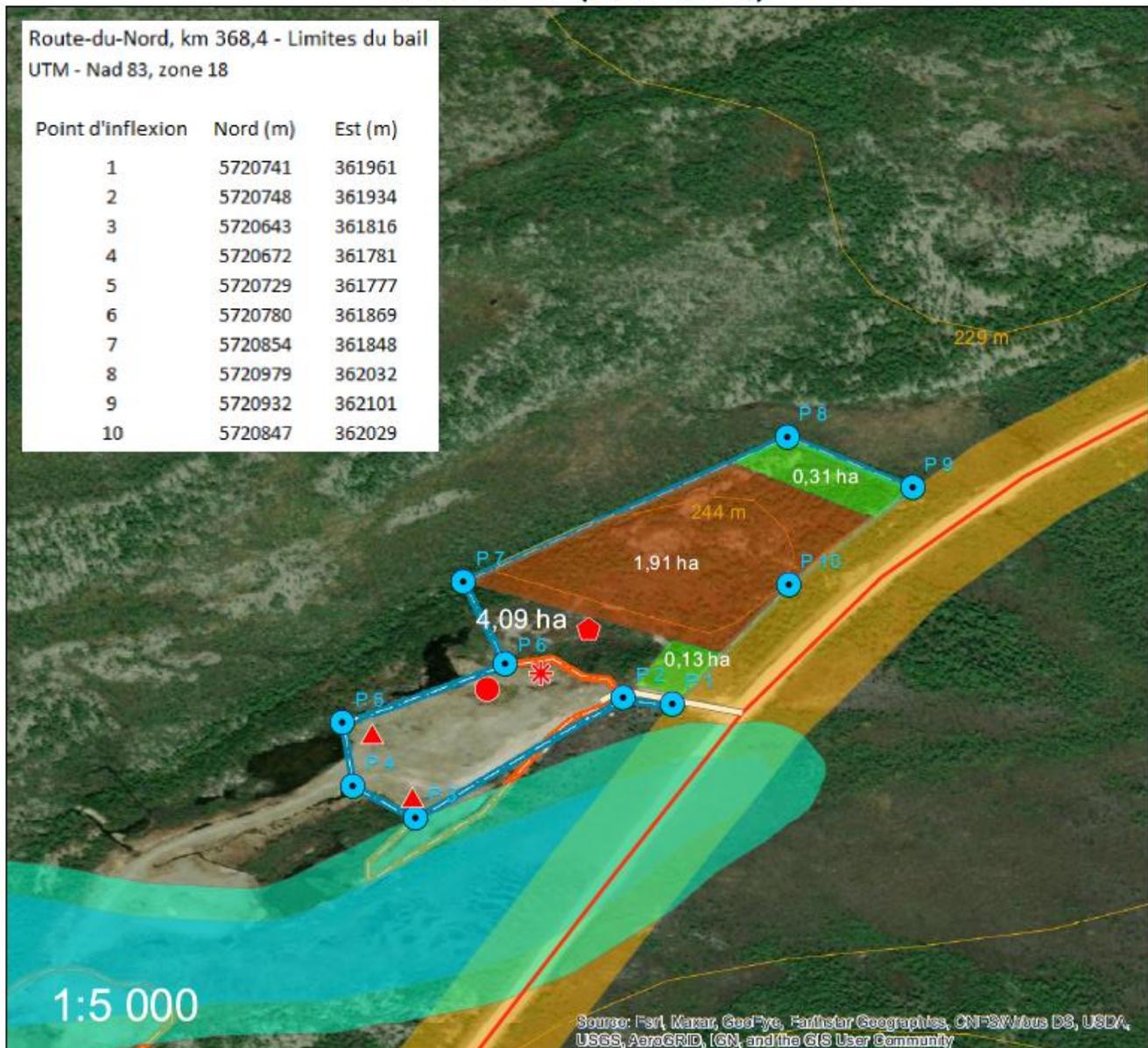
	Nouveau bail		Route du Nord
	Point d'inflexion		Exclusion de 40 mètres
Équipements			Chemins d'accès
	Chargement	Aménagements	
	Déchargement		Aire d'extraction
	Pile concassé		Aire d'entreposage de la terre végétale
	Concasseur		Milieu humide et hydrique
			Exclusion de 30 mètres
			Topographie locale

Société de développement de la Baie-James

Analyse environnementale
d'une gravière potentielle

Cartographie préparée par
Martin Filion, ing. f.
le 21 février 2022

Banc d'emprunt Route-du-Nord 32N11-4 (site #16)



Légende

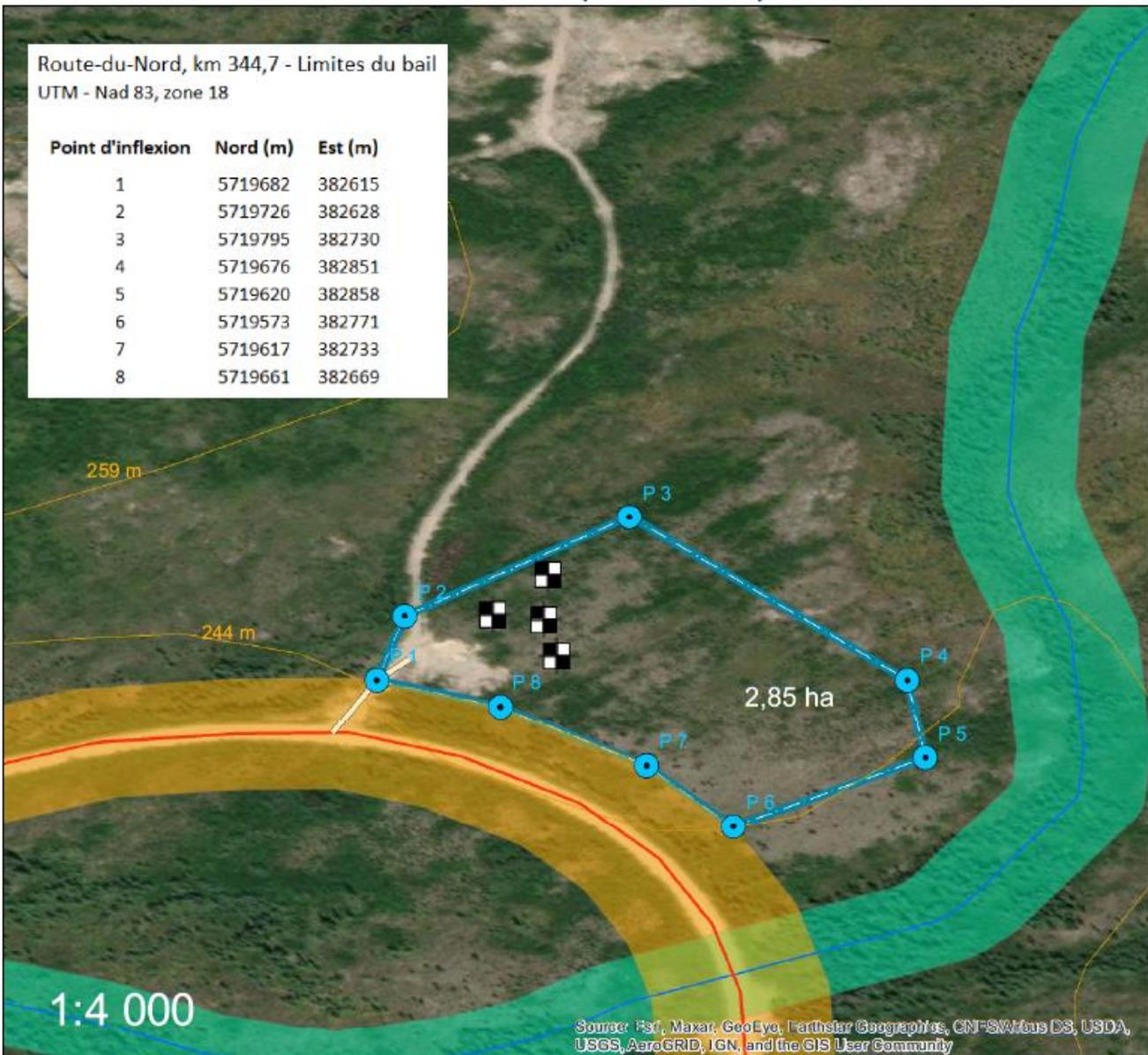
- | | |
|---------------------------|---|
| Nouveau bail | Équipements |
| Exploité | Chargement |
| Point d'inflexion | Déchargement |
| Route du Nord | Pile matériaux |
| Chemins d'accès | Concasseur |
| Exclusion de 40 mètres | Aménagements |
| Topographie locale | Aire d'extraction |
| Cours d'eau | Aire d'entreposage de la terre végétale |
| Milieu humide et hydrique | |
| Exclusion de 30 mètres | |

Société de développement de la Baie-James

Analyse environnementale
d'un banc d'emprunt

Cartographie préparée par
Martin Filion, ing. f.
le 4 février 2022

Banc d'emprunt Route-du-Nord 32N10-1 (site #25)



Légende

Délimitations

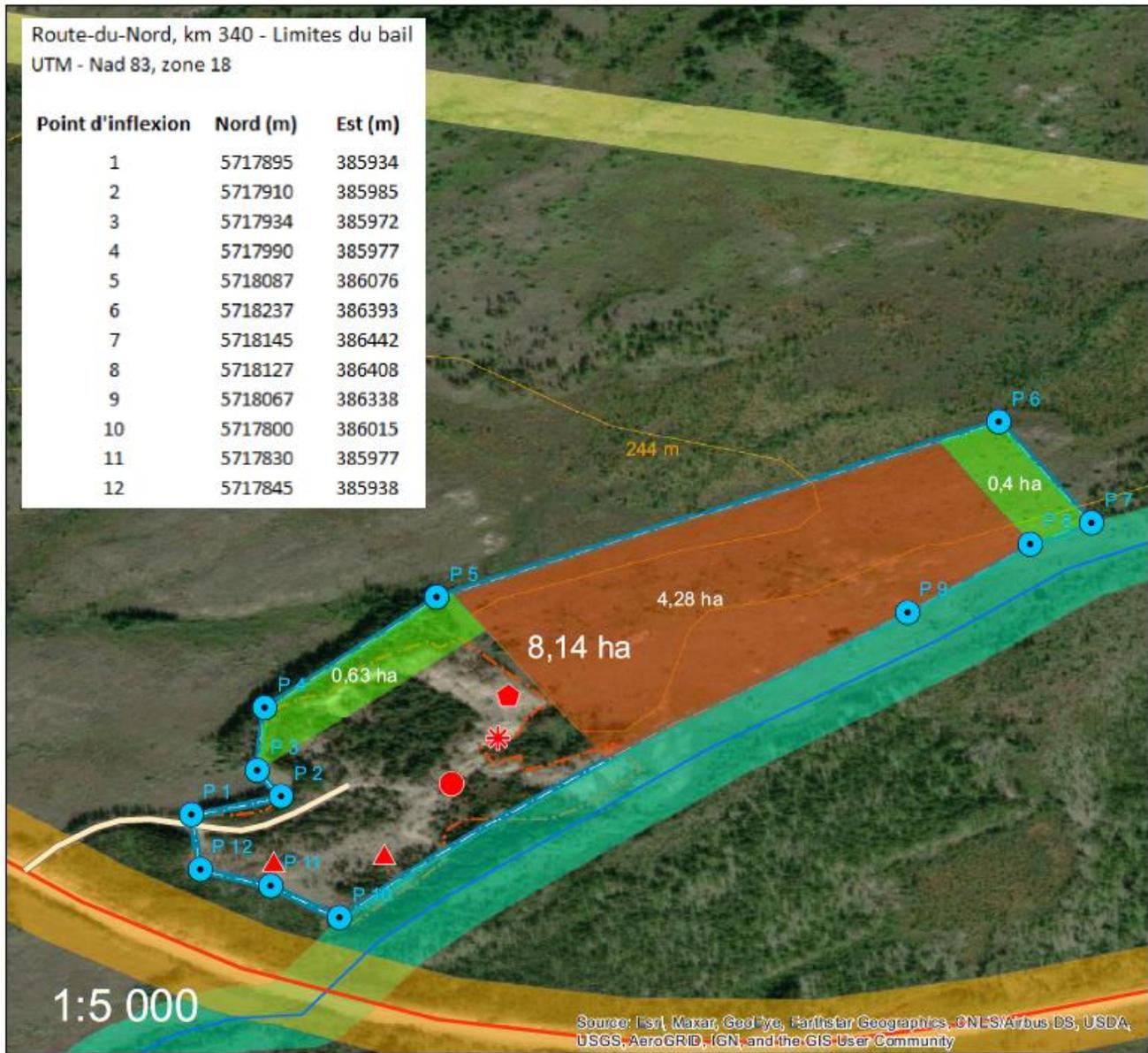
- Nouveau bail
- Point d'inflexion
- Route du Nord
- Exclusion 40 mètres
- Chemins d'accès
- Tranchée d'observation
- Cours d'eau
- Exclusion de 30 mètres
- Topographie locale

Société de développement de la Baie-James

Analyse environnementale
d'une carrière et d'une sablière

Cartographie préparée par
Martin Fillion, ing. f.
le 15 juillet 2022

Gravière Route-du-Nord Site #27



Légende

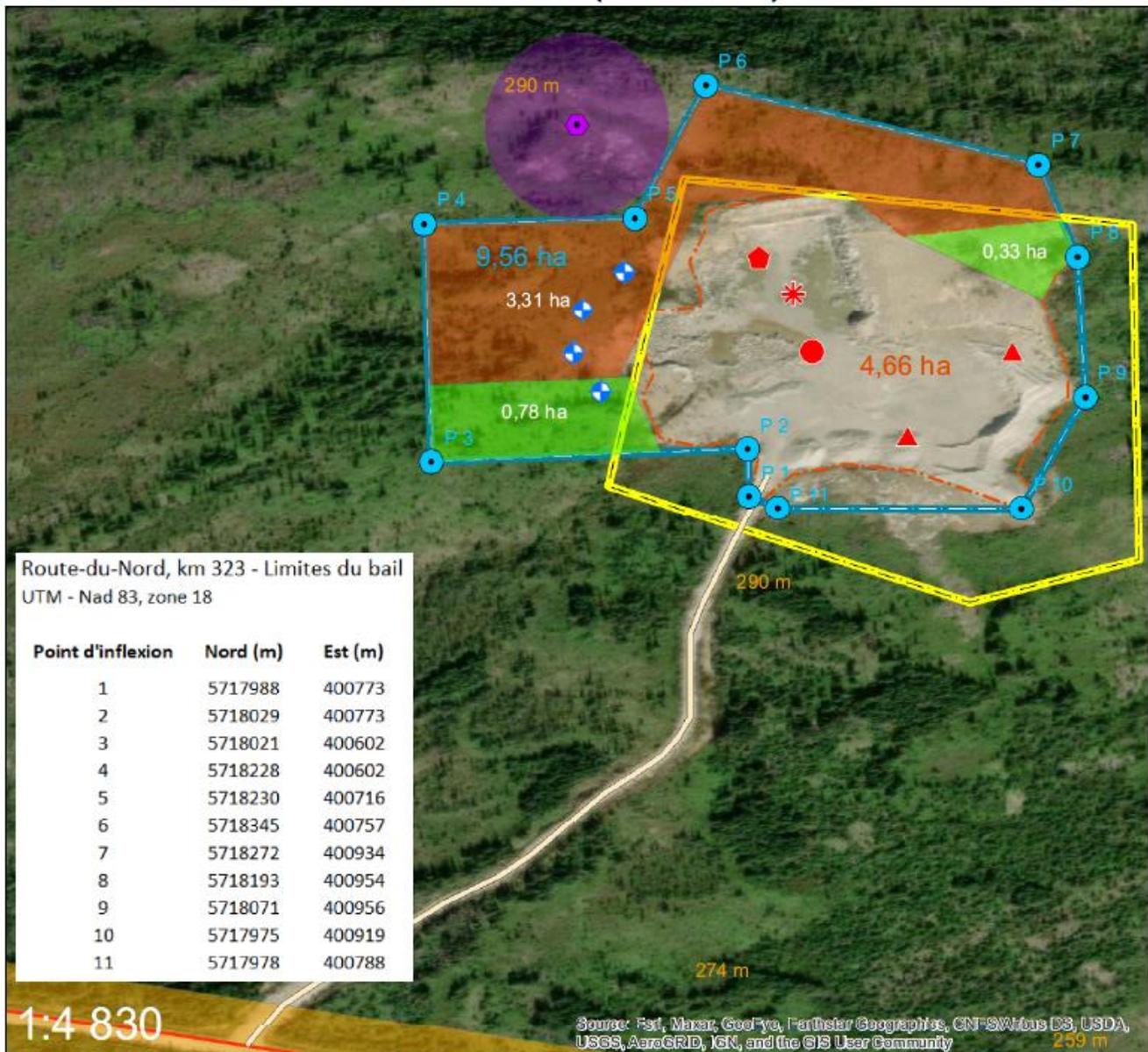
Nouveau bail	Équipements	Aménagements
Superficie exploitée	Équipemen	Aire d'extraction
Point d'inflexion	Chargement	Aire d'entreposage de la terre végétale
Route du Nord	Déchargement	Cours d'eau local
Chemins d'accès	Pile matériaux	Milieu humide et hydrique
Exclusion de 40 mètres	Concasseur	Exclusion de 30 mètres
		Emprise L.T.E.
		Topographie locale

Société de développement de la Baie-James

Analyse environnementale
d'une gravière potentielle

Cartographie préparée par
Martin Filion, ing. f.
le 4 février 2022

Carrière Route-du-Nord 32N09-14 (site #31)



Légende

Limite

- Point d'inflexion
- Nouveau bail
- Superficie exploitée
- Bail existant
- Route du Nord
- Chemins d'accès
- Exclusion 40 mètres

- Proposition de forage

Équipements

- Chargement
- Déchargement
- Pile concassé
- Concasseur

Aménagements

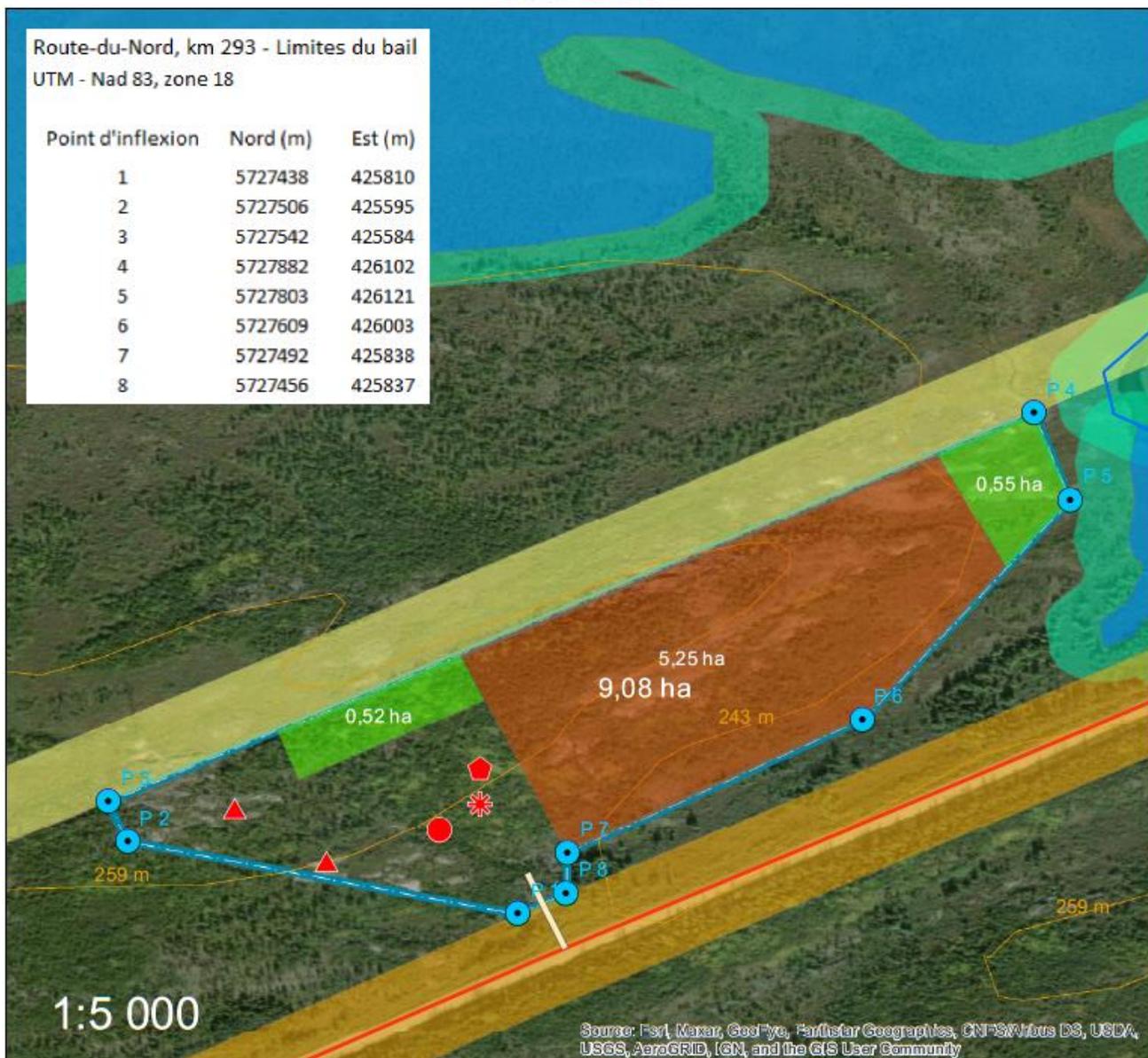
- Aire d'extraction
- Entreposage de la terre végétale
- Mat de mesure de vents
- Exclusion 80 mètres

Société de développement de la Baie-James

Analyse environnementale
d'une carrière potentielle

Cartographie préparée par
Martin Fillion, ing. f.
le 21 février 2022

Carrière Route-du-Nord Site #35



Légende

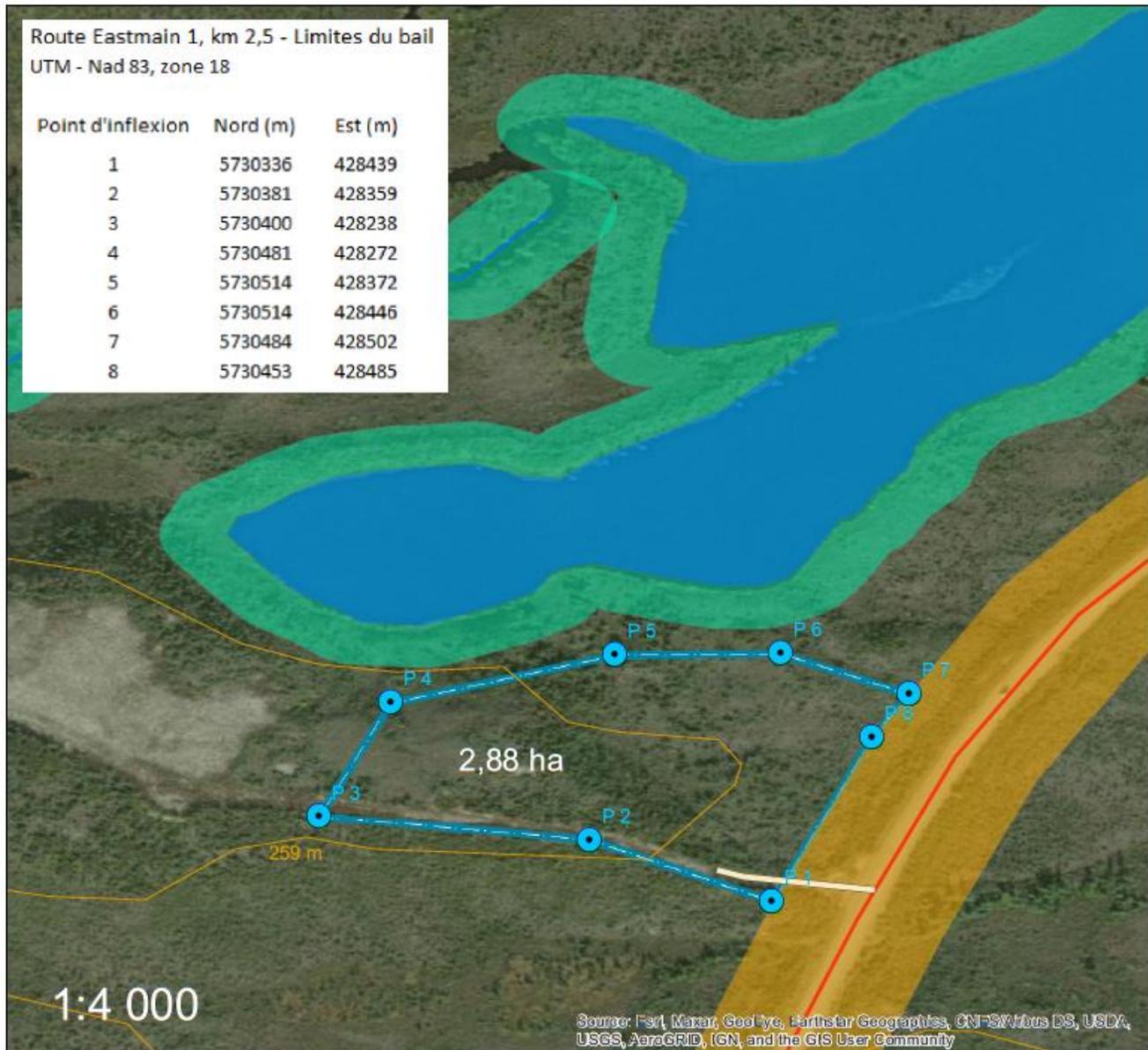
Nouveau bail	Équipements
Point d'inflexion	Chargement
Route-du-Nord	Déchargement
Chemins d'accès	Pile concassé
Exclusion de 40 mètres	Concasseur
Cours d'eau local	Aménagements
Milieu humide et hydrique	Aire d'extraction
Exclusion de 30 mètres	Entreposage de la terre végétale
Topographie locale	Emprise L.T.E

Société de développement de la Baie-James

Analyse environnementale
d'une carrière potentielle

Cartographie préparée par
Martin Filion, ing. f.
le 7 février 2022

Banc d'emprunt route Eastmain 1 Site #38



Légende

Délimitations

- Nouveau bail
- Point d'inflexion
- Chemin Eastmain 1
- Chemins d'accès
- Exclusion de 40 mètres

- Cours d'eau local
- Milieu humide et hydrique
- Exclusion de 30 mètres
- Topographie locale

Société de développement de la Baie-James

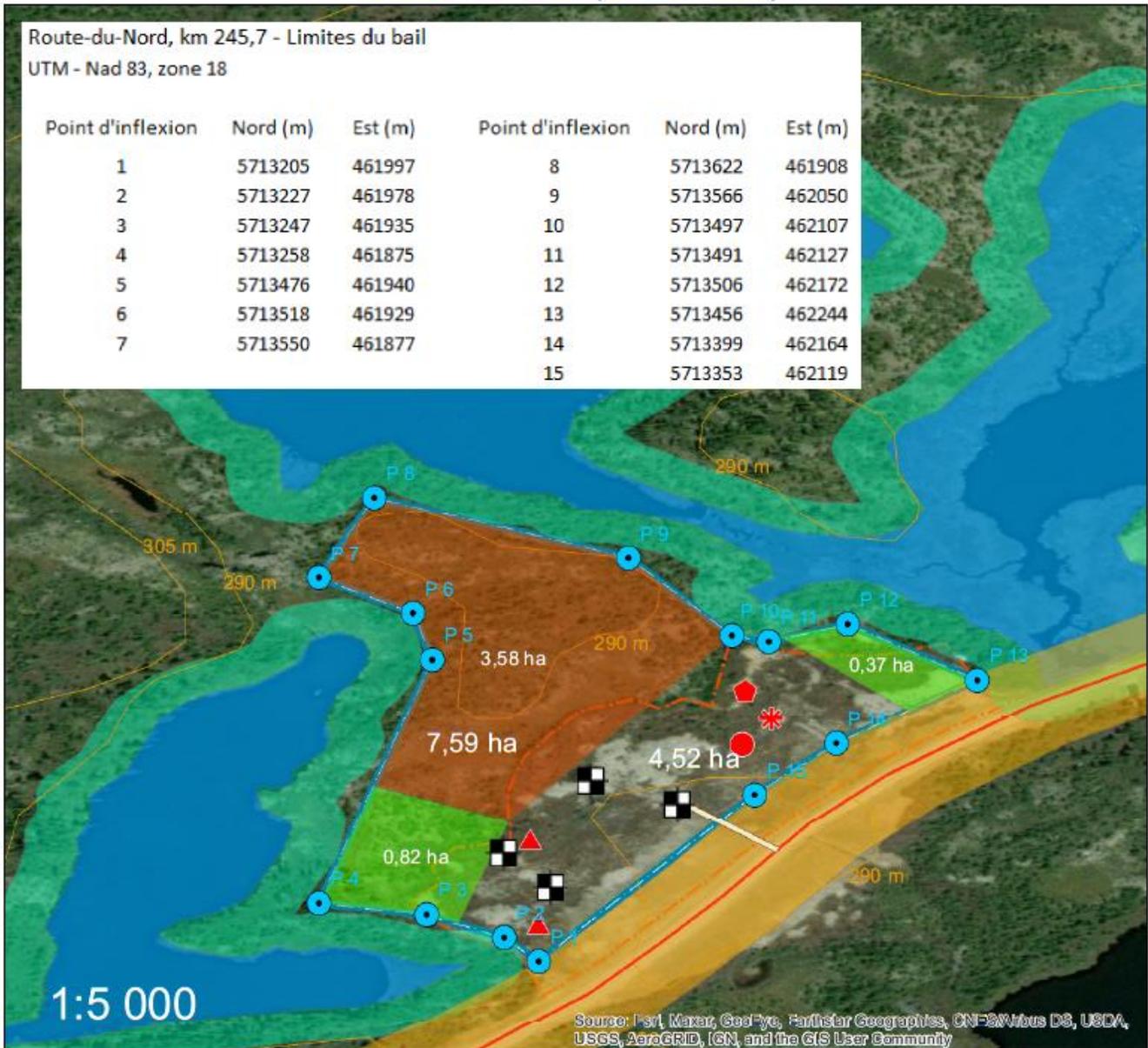
Analyse environnementale
d'un banc d'emprunt potentiel

Cartographie préparée par
Martin Filion, ing. f.
le 8 février 2022

Gravière Route-du-Nord 32012-25 (site #53)

Route-du-Nord, km 245,7 - Limites du bail
UTM - Nad 83, zone 18

Point d'inflexion	Nord (m)	Est (m)	Point d'inflexion	Nord (m)	Est (m)
1	5713205	461997	8	5713622	461908
2	5713227	461978	9	5713566	462050
3	5713247	461935	10	5713497	462107
4	5713258	461875	11	5713491	462127
5	5713476	461940	12	5713506	462172
6	5713518	461929	13	5713456	462244
7	5713550	461877	14	5713399	462164
			15	5713353	462119



Légende

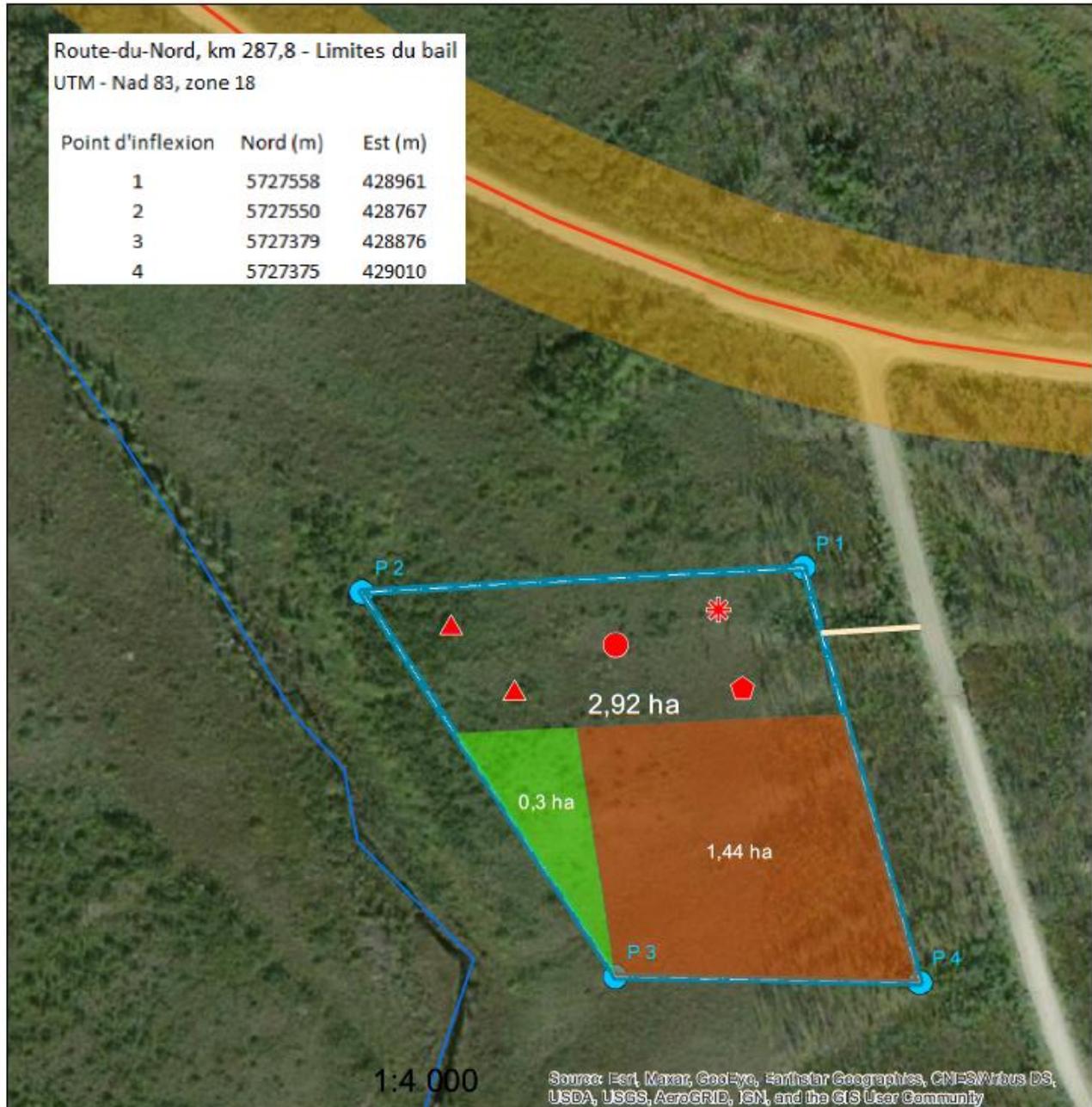
	Nouveau bail		Chargement
	Superficie exploitée		Déchargement
	Point d'inflexion		Pile matériaux
	Chemin local		Concasseur
	Chemins d'accès		Aire d'extraction
	Exclusion de 40 mètres		Aire d'entreposage de la terre végétale
	Milieu humide et hydrique		Tranchée d'observation
	Exclusion de 30 mètres		
	Topographie locale		

Société de développement de la Baie-James

Analyse environnementale
d'une gravière potentielle

Cartographie préparée par
Martin Filion, ing. f.
le 25 février 2022

Gravière potentielle Route-du-Nord Site #60



Légende

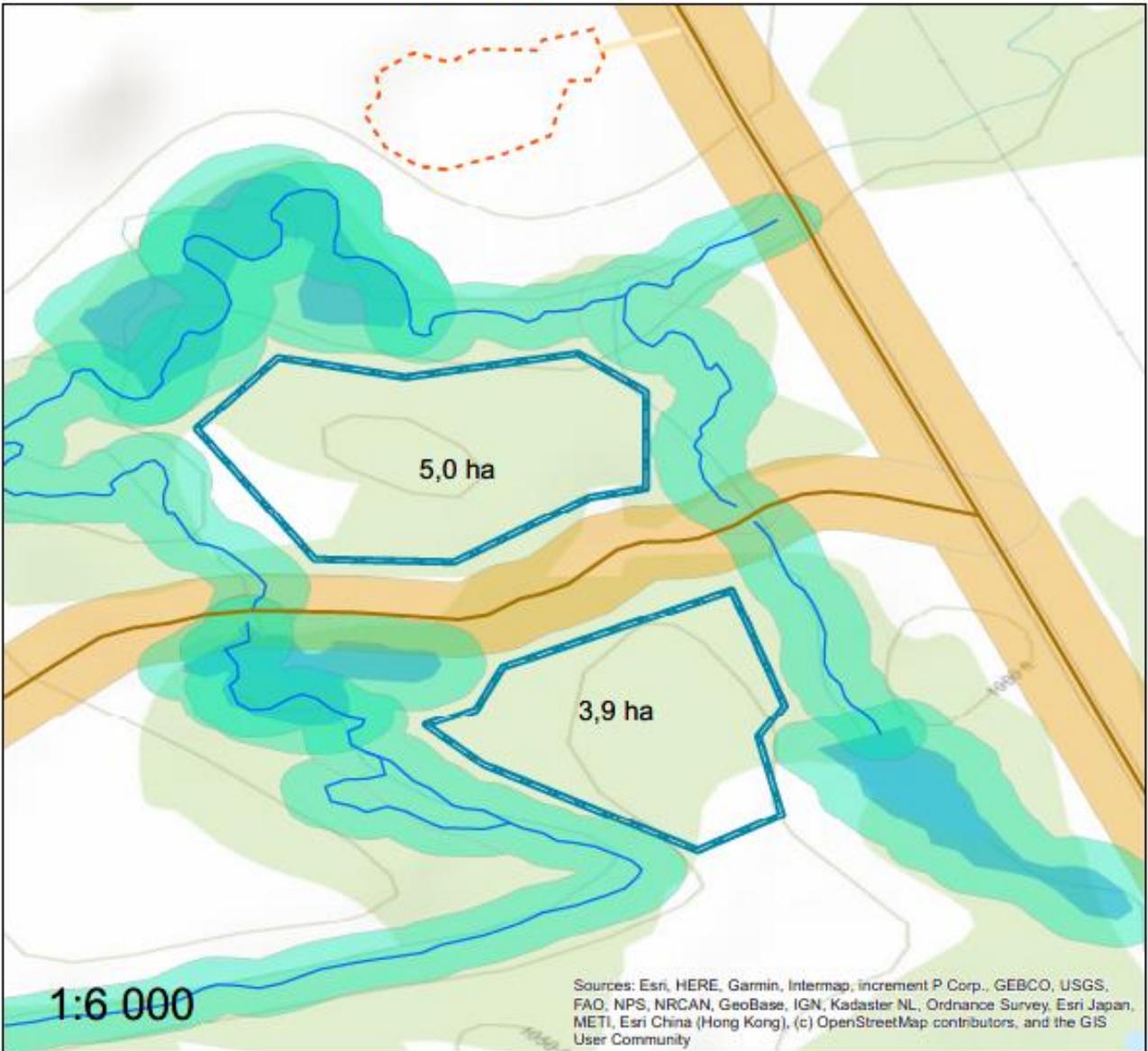
- | | | | |
|--|------------------------|--|---|
| | Nouveau | | Chargement |
| | Point d'inflexion | | Déchargement |
| | Chemin local | | Pile concassé |
| | Chemins d'accès | | Concasseur |
| | Exclusion de 40 mètres | | Aire d'extraction |
| | | | Aire d'entreposage de la terre végétale |
| | Cours d'eau local (3) | | |

Société de développement de la Baie-James

Ouverture, ré-ouverture
et suivi des carrières et sablières
d'intérêt pour la SDBJ

Cartographie préparée par
Martin Filion, ing. f.
21 février 2022

Gravière Route-du-Nord Site #62 - km 234



Légende

Délimitations

 Nouveau bail

 Partie exploitée

 Chemins d'accès

 Chemin local

 Cours d'eau local

 Exclusion de 30 mètres

 Exclusion de 40 mètres

 Plans d'eau et milieux humides

Société de développement de la Baie-James

Analyse environnementale
d'une gravière potentielle

Cartographie préparée par
Martin Filion, ing. f.
le 20 juillet 2022