Impact Assessment
Summary
(Unofficial Translation)

Processing of gold ore from the Barry and Moroy projects at the Bachelor site and increase in milling rate, Desmaraisville, Québec
TX17021601-0000-REI-0002-0

Prepared for:
Ministère de l'Environnement et de la Lutte contre les changements climatiques

September 26, 2019

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In the event of a discrepancy, the French version takes precedence

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List of units

Unit	
%	Percentage
°C	Degree Celsius
g/t	Gram per ton
ha	Hectare
kg/t	Kilogram per ton
km	Kilometer
km^2	Square kilometer
L/sq.m.	Liter per square meter
M	Million
m	Meter
mm	Millimeter
Mt	Million tons
oz	Ounce
t	Ton
tm	Metric ton
tpd	Ton per day
µm	Micrometer

Preface

This document constitutes a summary of Volume I of the "Impact Assessment: Processing of gold ore from the Barry and Moroy projects at the Bachelor site and increase in the milling rate, Desmaraisville, Québec".

The Impact Assessment (IA) consists of two volumes: Volume I contains all the chapters of the IA and, in the appendices, the drawings and maps, as well as limitations; Volume II contains the other appendices forming part of the IA. In general, this summary reproduces the main structure of Volume I.

1.0 Background

1.1 Introduction

The IA covers the expansion of the Bachelor mining site, located in the North Quebec Administrative Region (N-d-Q), to process gold ore from the Moroy project, located about 600 m to the south of the Bachelor underground mine, and the Barry project, located about 110 km to the southeast of the Bachelor site, in the Abitibi-Témiscamingue Administrative Region. The Barry project ore will be carried by trucks on existing forest roads.

To be more precise, this IA concerns an increase in the ore processing plant rate and expansion of the tailings facility at the Bachelor site (BTSF), extraction of the ore from the Moroy project and its processing at the Bachelor site, as well as transportation of the ore from the Barry site to the Bachelor site for processing. Extraction of the ore from the Barry site is not part of the Project for the purposes of this IA.

1.1.1 Terminology

For clarity purposes, the terms used to refer to certain aspects of the Project have been defined as follows:

- Bachelor site: location consisting of the mining camp and underground and surface installations dedicated to the extraction and milling of the ore from the Bachelor mine, as well as management of the mining tailings. In the context of the IA, the Bachelor site also includes the Moroy deposit;
- Bachelor complex: portion of the Bachelor site including the surface installations used to mill the ore and adjoining buildings;
- Bachelor mine: mining concession CM 510 and mining lease BM 1 025 where the underground ore extraction installations are located;
- Moroy deposit (or Moroy): the ore deposit of the projected Moroy mining lease located in the Moroy block;
- Barry site: location consisting of the mining camp and underground and surface installations dedicated to exploration of the Barry deposit;
- Barry deposit (or Barry): the Barry mining lease ore deposit;
- Barry-Bachelor transportation road: existing transportation road linking the Barry and Bachelor sites;
- New southern access: new road access to the south of the Bachelor complex to reach the northern end of the Barry-Bachelor transportation road.

1.2 Proponent and mandated consultant

1.2.1 Proponent

Metanor Resources Inc. (Metanor) is the Project's proponent. A gold producer whose assets are all situated in Quebec, Metanor mines the Bachelor site and continues to develop the Barry and Moroy deposits.

Metanor has been a wholly-owned subsidiary of Bonterra Resources Inc. (Bonterra) since September 2018. Bonterra's head office has been located in Val-d'Or since February 2019. With its acquisition of Metanor, Bonterra controls more than 22,000 ha of mining exploration properties, all located in the Urban-Barry mining camp.

The person in charge of the IA is the Vice President Operations of Metanor, the contact details of whom are given below.

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Project manager:	Pascal Hamelin, Ing. Vice President Operations
Quebec Enterprise N° (NEQ) on the Quebec Enterprise Register:	1161259883

1.2.2 Mandated consultant

Wood Environment & Infrastructure Solutions (Wood) was mandated by Metanor to prepare the IA. The contact details of Wood's main office in Quebec are given below.

Wood Environment & Infrastructure Solutions	
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Wood led the IA and is the principal author. Wood was supported by the following subcontractors for preparation of the IA: ACS Climatologie et Géomatique, Archéo-Mamu Côte-Nord, EGS Ecosupport, Catherine Lussier, PhD and T^2 Environnement.

1.3 Project overview

The aim of the Project is to process Barry and Moroy ore at the Bachelor complex for a period of 10 years, at a maximum rate of 2,400 tpd. Metanor currently holds an authorization to process the Bachelor mine ore at the Bachelor complex at a rate of 800 tpd. The operation has been on hold since the summer of 2018. Underground mining of the Bachelor mine under the current authorization in parallel with the eventual implementation of the Project will continue. At this stage, an increase in extraction of the ore from the Bachelor mine beyond the authorized threshold is not considered.

The main elements of the Project for the purposes of the IA can be summarized as follows:

- Develop the Moroy deposit, located around 600 m to the south of the Bachelor mine and part of the Bachelor site, by means of the surface and underground installations of the Bachelor site;
- Triple the Bachelor site ore processing plant capacity, chiefly by replacing part of the current equipment with modern, efficient equipment;
- Improve the condition of the existing Barry-Bachelor transportation road (≈ 110 km) and build a new access (≈ 1.2 km) to the south of the Bachelor complex to reach the existing road;
- Transport the ore from the Barry site to the Bachelor site for milling, using the transportation road;
- Expand the Bachelor complex to accommodate new piles of ore from the Barry site and allow for better storage distribution;

- Expand the BTSF to contain 8 Mt of tailings generated by the milling of ore from the Barry and Bachelor sites.

The projected use of the transportation road is based on the milling sequence envisioned, namely 30 consecutive days of ore from the Barry site, followed by a 10-day interruption during which ore from the Bachelor site will be milled. This sequence is based on the overall annual milling objective; it will be adapted to the Project's operational needs and constraints Thus, the ore milling cycles of the Barry and Bachelor sites could sometimes be shortened or lengthened for certain periods, resulting in occasional changes in trucking frequency.

1.3.1 Location

The principal Project location is the Bachelor site, situated around 225 km northeast of Val-d'Or, 95 km northeast of Lebel-sur-Quévillon (LSQ), 30 km southwest of the Cree First Nation of Waswanipi (CFNW) and 3.5 km east of the hamlet of Desmaraisville. The Bachelor site is situated in the municipality of Eeyou Istchee James Bay.

The Barry site is situated in the northeastern part of the Township of Barry, around 90 km east of LSQ and 65 km southeast of Desmaraisville. It is connected to the Bachelor site by an existing transportation road of around 110 km.

The Figure 1-1 locates the Bachelor and Barry sites in a regional context.

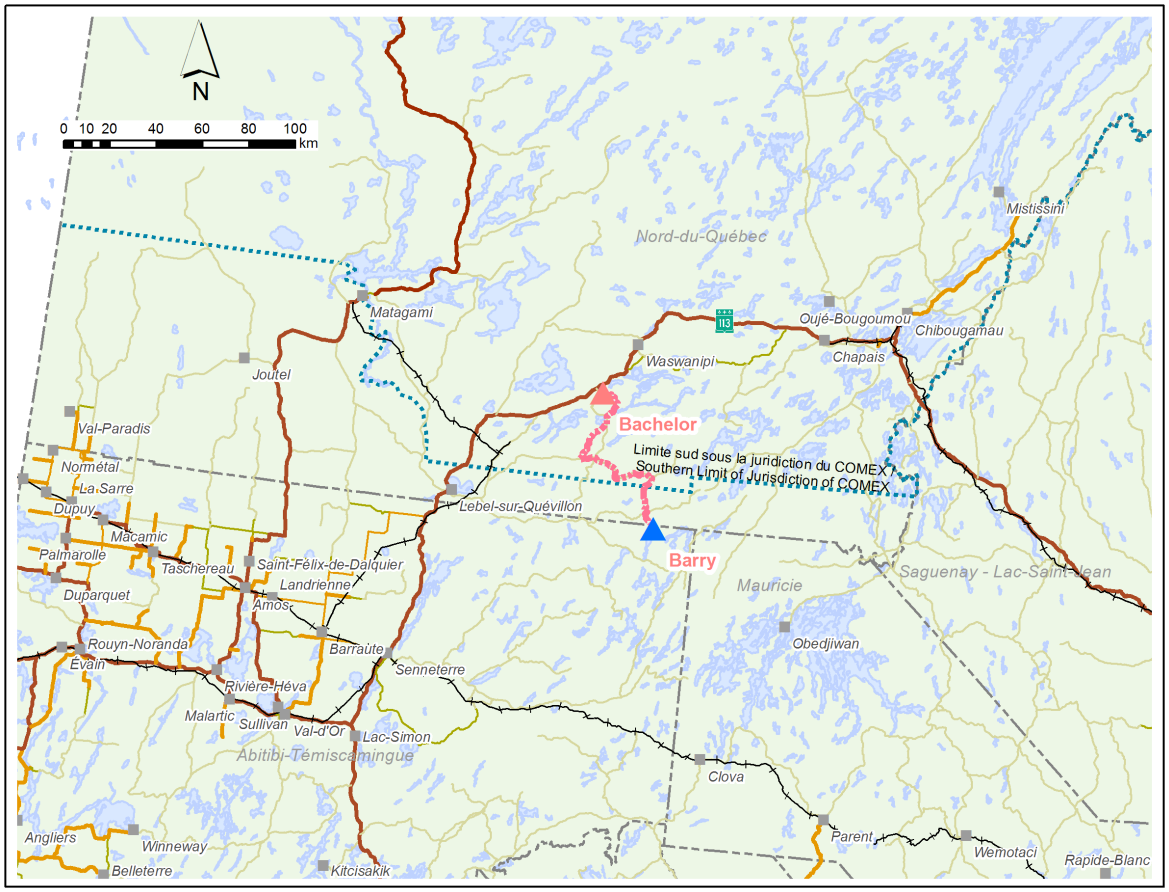

Figure 1-1. Location of the Bachelor and Barry sites in a regional context

1.3.2 Land ownership

The Bachelor property consists of 223 cells, two mining concessions and a mining lease covering a total surface area of 11,841.5 ha. Metanor holds all the interests in this property. The location of the Bachelor property is shown in Plan 001.

A mining lease request was filed with the Ministry of Energy and Natural Resources (MERN) in 2018 for the startup of production from the Moroy deposit, from the Bachelor mine extraction installations.

Metanor holds all the Barry site interests.

1.3.3 Implementation schedule and cost

The completion dates for the main components of the Project are presented in the preliminary schedule below.

Task	Completion Date
Detailed development of the engineering	Quarter 3, 2019
Definition of the Moroy and Barry deposit resources	Quarter 2, 2019
Awarding of the authorizations for the construction phase	Quarter 1, 2020
Increase in the ore processing plant rate	Quarter 2, 2020
Expansion of the BTSF (phase 1)	Quarter 2, 2020
Upgrading of the transportation road, construction of the new access to the south and extension of the Bachelor complex	Quarter 2, 2020
Operation (starting Quarter 1, 2020)	2030

At this stage in the design of the Project, the estimated investment cost is in the region of $30 M. This estimate will be revised as the detailed engineering currently underway progresses.

1.4 Project justification

Metanor possesses good-grade gold resources with several years' potential. Given the work completed to date, Metanor estimates that the Barry and Moroy sites together have the potential to deliver 9 Mt, 5 Mt of which will come from the Barry site. The estimate of the mineral resources according to Canadian Standard 43-101 announced in May 2019 reports 2,052 Mt of indicated gold resources (5.84 g/t) and 2,740 Mt of inferred resources (5.14 g/t), with a cut-off level of 3.5 g/t at the Barry site. As far as the Moroy deposit is concerned, the said estimate reports 667,005 Mt of measured, indicated gold resources (5.17 g/t) and 396,000 Mt of inferred resources (4.32 g/t), with a cut-off level of 3.0 g/t.

The quantity of ore processing envisaged by the Project is such that the current ore processing plant on the Bachelor site will not be adequate for processing the scheduled tonnage at an economically profitable rate and that expansion of the milling capacity is required. An increase in plant capacity and an expansion of the BTSF will allow Metanor to develop the Barry and Moroy deposit resources. In addition, the acquisition of Metanor by Bonterra consolidates the investment base for the sustained development of gold resources.

The economic benefits of the Project are considerable, both in investment and in the creation and maintenance of direct and indirect jobs in the region for the next decade. Job opportunities and contracts will rise for the Indigenous and non-Indigenous populations concerned.

The Project will lead to the upgrade of several existing infrastructures, including the above and below-ground infrastructures of the Bachelor and Barry sites and the public forest roads used as the transportation road between the Barry and Bachelor sites, which will be continuously maintained during the course of the Project, together with the main access to the Bachelor site via Route 113.

Finally, it should be noted that central banks have been accumulating gold since 2011. With the levels of indebtedness of several countries, the demand for gold will remain high over the next few years.

1.5 Sustainable development objectives

In line with its environmental policy, Metanor maintains a sustainable development policy backed by secure, practical and socially-responsible practices. Amongst other things, Metanor is committed to minimizing the environmental impact of its activities as far as possible, ensuring that the people responsible for protecting the environment possess the required competency and that its employees and subcontractors are trained in and made aware of protecting the environment.

As a member of the Quebec Mining Association (AMQ), Metanor adheres to the commitments presented in the AMQ's Sustainable Development Charter. Since 2014, the AMQ and its members have been committed to the TSM *(Towards Sustainable Mining)* initiative, developed by the Mining Association of Canada (AMQ, 2018). In the context of this initiative, mining corporations are required to make an annual assessment of their level of performance as regards their environmental and social practices (between levels C and AAA), assessed every three years by independent inspectors (AMQ, 2018; AMC, 2018) . Metanor is looking to achieve a level "A" in the near future.

The description of the Project and the variants considered (Chapter 3) show how the Project is founded upon a sustainable development viewpoint. In this respect, we should emphasize the rehabilitation of existing infrastructures to minimize encroachment on natural areas, the repurposing of waste rock and tailings, minimization of encroachment on wetlands and the prevention of encroachment in another watershed and in fish habitat. Finally, the Project will be a vector for continued, growing economic benefits and reinforcement of the capacities of Indigenous and non-Indigenous local and regional populations.

1.6 Project history

Exploration of the Bachelor property dates back to 1946, with the discovery of gold outcrops and, in the following few years, prospecting and sampling work. Surface and underground exploration work took place when the first resource estimates were made from 1975 onwards.

The Bachelor mine started operation in 1982. Apart from a shutdown to deepen the shaft and mine in 1987, the Bachelor mine was producing until 1989. The reported production of milled ore is 869,418 t for a total of 131,029 oz of gold refined. A small quantity of ore was apparently extracted by a mining entrepreneur in 1992 before the mine was allowed to flood following the anticipated prolonged closure.

From 2008 onwards, Metanor has been undertaking assessments and work to put the Bachelor site back into operation. Re-opening of the mine implied the retrofit of the ore processing plant to receive the ore from small open pits on the Barry site, for which an impact assessment was submitted in 2007. Metanor subsequently submitted another impact assessment in 2011 to extract and process 900,000 t of ore from the Bachelor mine in the Bachelor complex.

1.7 Related projects and developments

1.7.1 Barry site

From 2008 to 2010, the Bachelor site ore processing plant was supplied with 606,000 t of ore, extracted from three open pits on the Barry site. In April 2011, Metanor obtained a modification to the certificate of authorization (CA) to step up the extraction level from the Barry site open pits to 1.2 Mt. However, since 2011 only exploration activities have taken place on the Barry site and, in 2016, Metanor concluded that the best way to recover the ore from the Barry site was underground. A CA modification (Amec Foster Wheeler, 2017) was submitted in November 2017 to install a ramp in the Barry site pit currently authorized and extract the ore from the Barry site from under the ground at a lower rate of 600 tpd.

This request did not cover modification of the 1.2 Mt threshold previously authorized by the Barry site and adhered to the same perimeter already authorized. Modification of the CA was approved in January 2018 and, subsequently, a short ramp was installed in 2018 for the purposes of the bulk sampling program and exploration drilling in 2019.

1.7.2 Coniagas mine

Located around 1.5 km to the west of the Bachelor mine, the Coniagas polymetallic mine was exploited from 1961 to 1967. Metanor owns the mine (the subsurface) and possesses the entire CM 478 mining concession relating to it. It should be noted that a mining company other than Metanor and Bonterra is responsible for the eventual restoration of the site and rehabilitation of the premises (on the surface). The mine is part of Metanor's exploration program.

1.7.3 Exploration programs

Metanor and Bonterra are continuing exploration activities in the Urban-Barry mining camp. Apart from the Moroy deposit, estimated according to Canadian standard 43-101 in 2019, the same estimate was also made for the Gladiator deposit. The Bart, Moss and St. Cyr gold zones, all situated within a 13 km radius of the Barry site, are also part of the exploration program.

1.8 Legal and regulatory framework

The Project is situated in the application territory of the environmental assessment (EA) regime set out in Chapter 22 of the *James Bay and North Quebec Agreement* (JBNQA). The only elements of the Project situated beyond the said application territory are the Barry site and the first 20 km or so of the Barry-Bachelor transportation road. The Barry site infrastructures and activities are not considered in the framework of the IA.

After Metanor filed the preliminary information for the components of the Project situated in the applicable territory, the Evaluating Committee (COMEV), responsible for examining the preliminary information provided by the proponent of a project situated in the territory governed by the JBNQA situated to the south of the 55th parallel, determined that the Project must be subject to the evaluation and social impact assessment and review procedure. As a result, in July 2017, the COMEV issued the Directive for the preparation of the IA.

The Environmental and Social Impact Review Committee (COMEX) is responsible for examining the IA and recommending to the Administrator responsible for Chapter 22 of the JBNQA whether or not the Project should be authorized and, if applicable, the conditions for execution.

In light of the Project parameters, it is not subject to the *Impact Assessment Act*.

Metanor is currently the holder of the authorizations required to extract and process 600,000 t of the ore from the Bachelor mine at a rate of 800 tpd. Following the EA process and obtaining of the Quebec Government decree, Metanor will submit the necessary authorization applications for execution of the Project. The main authorizations to be obtained are listed in Table 1-1. The subcontractor responsible for trucking will possess the necessary authorizations for the servicing and refuelling of trucks.

Table 1-1. Authorizations to be obtained

Authorization/Permit	Regulatory Authority	Comments
Government of Quebec		
Authorizations, art. 22 EQA	MELCC	Amendment to the authorization issued July 4, 2012 Authorization for the development of the infrastructure/equipment of the Project Amendment of the depollution attestation Authorization for work in wet and damp environments Amendment of the hazardous materials management Authorization for the recovery of waste rock
Lease of public land and authorization for the location of the tailings storage site, arts. 47, 239 and 242 of the *Mining Act*	MERN	Expansion of the BTSF
Redevelopment and rehabilitation plan, art. 232.1 of the *Mining Act*	MERN	Update of the restoration plan
Forest management permit, art. 73 of the Sustainable *Forest Development Act*	MFFP	Deforestation; expansion of the Bachelor complex; development of the new southern access; improving the condition of the Barry-Bachelor transportation road
Effluent discharge objectives (EDO)	MELCC	Update of EDOs relating to industrial discharges in aquatic environment
Government of Canada		
Request for review, art. 35 of the *Fisheries Act*	ECCC	If necessary, work on fish habitat when certain culverts are repaired
Environmental Effects Monitoring (EEM) study, art. 7 of the *Metal and Diamond Mining Effluent Regulation* (MDMER)	ECCC	Modification of the EEM parameters if necessary
Eeyou Istchee James Bay Regional Government (EIJBRG)		
Permit and certificate under by-law no. 76 relating to permits and certificates, prerequisites to issuing building permits, and the administration of zoning, subdivision and construction by-laws	EIJBRG	Construction and expansion of mining infrastructure
Déclaration de conformité aux règlements municipaux (Declaration of compliance with municipal by-laws)	EIJBRG	Construction and expansion of mining infrastructure as per the activities set out in art. 22 of the EQA

2.0 Communications and consultations

2.1 Communications and consultations program

As part of the planning of the Project, Metanor provided for a communications and consultation process with the main communities liable to be affected by the Project. These communities are the CFNW, Desmaraisville and LSQ.

The purpose was to inform them about the Project, answer their questions, document their concerns, expectations and recommendations to take them into account in the production of the IA, meet them again to present the preliminary version of the IA and discuss integration of the observations made during the first meeting.

Table 2-1 summarizes the meetings held in 2018-2019 as part of the IA of the Project. Public information meetings were held in LSQ and Desmaraisville. Meetings with representatives of LSQ services or departments and Desmaraisville businesses were also held.

Several efforts were made to present the Project in Waswanipi at a general meeting and at the same time meet the representatives of the relevant departments or services, but they turned out to be fruitless, either due to unforeseen circumstances in the community, or due to the announcement of an eventual acquisition of Metanor, resulting in cancellation by the CCFNW of a public presentation scheduled for July 3, 2018, for the purpose of obtaining more information on the transaction before proceeding with a consultation on the Project. Nonetheless, a presentation of the Project was given to the CCFNW on May 29, 2018 and to certain members of the CCFNW and other Waswanipi Crees on November 5, 2018.

It had been agreed to hold the meeting on November 5, 2018 to present an update of the Project to the entire CCFNW. Efforts were made to do so, and to present to all CFNW members the preliminary results of the IA at the end of 2018 or in early 2019, but these meetings could not be confirmed at the time the writing of the IA was concluded. Thus, the second round of public meetings initially scheduled was not held.

Meetings were held with CFNW target groups – tallymen, young people, women and one Elder. Other Elders we not available. The tallymen who granted interviews are those whose land crosses the Barry-Bachelor transportation road; the tallyman whose land intersects with Bachelor Lake was also consulted.

Metanor, the CFNW and Grand Council of the Crees (Eeyou Istchee) / Cree Nation Government (GCCEI/GNC) are renegotiating the collaboration agreement.

Table 2-1. Meetings with the concerned communities, 2018-2019

LSQ	Desmaraisville	CFNW
Public meeting		
April 30, 2018 (3 LSQ citizens)	May 1, 2018 (1 Desmaraisville citizen)	Cancelled several times
Meetings with target groups		
Meetings with resource people of services or departments held on April 30, 2018	Meetings with the owners of the bar and convenience store held on May 1, 2018 Discussion group scheduled with territory users cancelled due to a lack of participants	Discussions on the use of land and resources with the users of W24A, W24D, W25A, L19 and W21 plots: April 9, 10 and 30, 2018 and January 16-17, 2019 (8 CFNW members)
		Presentation to the CCFNW: May 29, 2018
		Discussion groups with young people, women and one Elder: July 30-31, 2018 (14 CFNW members)
		Presentation to the W24A, W25A and L19 tallymen, the Vice-Chief, a CCFNW councillor and members of the Natural Resources Committee: November 5, 2018 (8 CFNW members)
		Discussion with the W21 tallyman: January 16-17, 2019

2.2 Results of the communications and consultations program

The meetings in Desmaraisville did not raise any issues, while the LSQ socio-economic players expressed their expectations for economic benefits. On the other hand, participants in the meetings in Waswanipi expressed several concerns, questions, expectations and recommendations regarding the Project. The Table 2-2 summarizes the main points raised at meetings in Waswanipi.

Table 2-2. Main concerns, questions, expectations and recommendations

Environmental concerns and questions
Potential impact on water bodies and fishing: Concerns relate to possible contamination of the Bachelor and Barry lakes, which are connected to water bodies of importance to the Crees, both as fishing locations or spawning areas.
Risk of the BTSF dike giving way: Concern relating to the risk of a breach of the BTSF dike, in line with the accident in Chapais in 2008.
Risk of toxicity from ore processing: Use of cyanides and flotation which might be dangerous and toxic.
Concerns and questions relating to nuisances and traffic
Potential disturbances (dust and noise): Concerns as to the noise from trucks, traffic and dust, as well as the cumulative impact with dust emitted from Osisko activities.
Potential impact of high levels of traffic on safety: Concern as to the dangers of high levels of traffic on the Barry-Bachelor transportation road for territory users.
Potential impact of high levels of traffic on use of the territory: Concern that the high level of traffic along the Barry-Bachelor transportation road might have a negative impact on hunting activities. Concern about not being able to reach their camps due to hindrances caused by the Project.
Cumulative impact
Concern as to the cumulative impact by the Project with other mining and forestry activities in the region, in terms of noise, dust, traffic and loss of forest cover.
Expectations of benefits
Improvement of access roads: Expectations concerning improvements to the access roads leading to certain Cree camps and repairs to the Barry-Bachelor transportation road, damaged by Project trucks.
More jobs and training: Suggestions for training, jobs and contracts for Waswanipi Crees. Suggestion that families affected by the Project be given priority consideration for jobs. Interest and willingness to work in ore transportation and road maintenance.
Financial compensation: Suggestion that financial compensation should be given to counter the Project's negative impacts on hunting.
Recommendations and mitigation measures
Environmental protection: Recommendations concerning the installation of a fence to protect Barry Lake from overfishing and the use of dust suppressant if not toxic.
Road Safety: Recommendations on: stopping Metanor truck traffic during certain hunting periods; introduction of a speed limit on the Barry-Bachelor transportation road; clearing of 5 m on each side of the transportation road to improve visibility; installation of road signs; warning to communities before trucks pass.
Tailings management: A question as to the use of tailings after closure of the Project; suggestion that tailings be dry-stacked to enable the BTSF to serve as a landing site for geese arriving from the south after the Project's closure.
Use of alternative routes: Suggestions for alternative routes, either for Metanor or for the users of the territory.

2.2.1 Discussion Committee

A Discussion Committee was set up in 2011 between Metanor and Cree representatives. Its purpose is to inform the concerned communities about its activities and openly discuss their concerns and questions. The aim of the Discussion Committee is to support Metanor in the development of its activities in the Eeyou Istchee James Bay territory, ensure better social acceptability and proactive, transparent, responsible management of the corporation's activities, in collaboration with the community. Its members include representatives from Metanor, Desmaraisville and the Eeyou Istchee James Bay Regional Government (EIJBRG). Since the CFNW had expressed its preference to participate only in the Harmonization Committee (Section 2.2.3), it does not participate in the Discussion Committee (P. Hamelin, 2018).

2.2.2 Collaboration agreement

The collaboration agreement (the Agreement) between the CCFNW, GCCEI/CNG and Metanor, signed in September 2012, establishes the bases of the relationship between the parties. In summary, the aim of the Agreement is to ensure the continuity of traditional Cree culture on trapping lands, training, job and contract opportunities for the Crees, economic benefits for the GCCEI/CNG and CCFNW, transparency between Metanor and the CFNW in terms of environmental management and involvement of the CFNW in the planning of site closures.

2.2.3 Harmonization Committee

The Harmonization Committee, created by the Agreement, seeks mutually acceptable solutions to questions or disputes and to ensure the implementation, management and monitoring of the solutions found. It also plays a role in the tendering process by designating the Cree businesses for which Metanor will reserve one third of invitations for tenders as far as possible, by assisting Metanor in considering the Cree content and examining how Metanor evaluates certain bids. The Harmonization Committee is composed of three members of Metanor, two members of the CFNW and one member of the GCCEI/CNG. Each member has one vote.

3.0 Description of the Project

3.1 Alternative means of carrying out the Project

The main alternative mean of carrying out the Project is not to go ahead with it.

Abandoning the Project would have significant economic impact. Not only would the anticipated economic benefits of the Project not materialize but those obtained from operations currently authorized would also be lost as continued mining operations at the Bachelor site depends on the capacity to process the ore from the Moroy and Barry deposits. From an environmental standpoint, abandoning the project would probably trigger closure of the Bachelor mine and rehabilitation of the site in the near future.

3.2 Variants

3.2.1 Increase in the ore processing plant rate

Although most of the ore will come from the Barry site, which is located some 110 km from the Bachelor site, Metanor has opted to increase the processing rate of the Bachelor plant rather than build a new ore processing plant on the Barry site. This way, Metanor has given preference to reusing existing structures, including the BTSF.

3.2.2 Ore trucking

It has recently been envisaged to form automated road convoys of up to four trucks, with only the first one with an actual driver, the following trucks being autonomous. This method will reduce the effects on use of the territory beside the transportation road as the return trips of trucks will be grouped. Consequently, the trips made by this type of convoy will be much less frequent than those made by separate, individual trucks. Moreover, automation would slightly reduce the number of workers. This variant will be gradually introduced during the Project.

3.2.3 Expansion of the tailings storage facility

With the increase in resources, the BTSF capacity will need to be stepped up to support the production forecast. The BTSF must be able to take in an additional 8 Mt of tailings.

Metanor has set out to define a concept for an increase of the BTSF capacity that limits the impact on biophysical and human environments, while taking technical, economic and regulatory aspects into account. To this end, various options have been studied using a decision analysis matrix to determine the best concept tailored to sustainable development principles.

Six options were initially determined for analysis. The results obtained were presented to the Ministry of the Environment and the Fight against Climate Change (MELCC), following which two options were chosen for further investigation. The basic criteria below were developed to focus optimization efforts on the two options selected:

- Minimize the expansion of the current BTSF footprint;
- Minimize the quantity of water to be managed;
- Avoid or minimize the disturbance of wetlands and fish habitats;
- Avoid or minimize the disturbance of another drainage basin;
- Keep the same mining effluent discharge point (not add another outfall).

Minimization of the expansion of the current BTSF footprint requires a technical feasibility assessment to contain the ground load of the mass resting on a reduced surface area. To do this, a change in the tailings storage method from pulp-type tailings with pumping to a type of dry stacked tailings has been considered. The stability analysis has shown that the stability criterion is just about achieved with a 10H:1V slope but that the storage volume for flood waters is not sufficient without increasing the ground surface area. A rise in the level of water basins to increase the capacity was considered but this increases the interaction of tailings with the water table, as well as reducing safety factors to an unacceptable level. As a result, the dry stacking option was rejected. The option to expand the BTSF southwards was adopted as it best meets all basic criteria.

3.2.4 Road segments for the transportation of Barry ore

During consultations in 2018, an alternate segment for a section of the Barry-Bachelor transportation road was suggested. This is the southern portion of Road 4000, which runs along the Wetetnagami River towards Nicobi Lake and then joins Malouin Lake (Map 002).

Metanor concluded that several million dollars would have to be invested to restore this segment. In addition, the area is known to be prone to flooding, which makes it a high-risk area.

3.3 Current situation

This section summarizes the main facts of the current situation as far as current authorizations are concerned. Although operations at the Bachelor site have been suspended since the summer of 2018, Metanor has had an authorization from the MELCC since 2017 to extract an additional 600,000 t of ore from the Bachelor mine and process it in the Bachelor complex at a rate of 800 tpd.

The Bachelor mine deposit is of the low-power narrow vein type (medium thickness). The mining method recommended is that of unfilled long-hole stoping. Emulsion is the principal explosive used in the Bachelor mine, at a ratio of 0.11 kg/t of ore. In light of the mining method and geology, the ore /waste rock ratio is 3 t of ore to 1 t of waste rock. The waste rock extracted underground is mainly used as filler material in the underground galleries of mined-out stopes. If waste rock is required for construction material, it is stored in a temporary pile with a capacity of around 71,000 t. The raw ore is stored in a silo and two temporary piles. Each has an area of over 70 m by 40 m and can reach a height of 15 m with 2:1 slopes. The waste rock and ore piles are located within the watershed of the BTSF.

The ore processing plant uses the carbon-in-pulp process. Mining tailings are deposited in the BTSF, an area of around 70 ha. The conventional depositing method was initially used but, in 2017, a new tailings management concept was implemented, integrating the stacking of dry tailings. These silty tailings, produced at variable rates, have low acid generation potential (AGP) but are contaminated with cyanides from the ore processing plant.

Plans 001 to 003 present the existing facilities and buildings on the Bachelor site. The main source of power on the Bachelor site is Hydro-Quebec.

Water is mainly managed on the Bachelor site via the supernatant pond and the sedimentation pond located at the downstream toe of the BTSF. An internal recirculation circuit supplies 90% of the water required to process the ore. An industrial water treatment plant oxidizes the available cyanides with ozone and precipitates the strongly bound cyanides with the addition of ferric sulfate. The precipitated particles are flocculated and captured in a Geotube, the filtrate of which is deposited in the sedimentation pond. Metanor is authorized to transport and discharge the sludge accumulated inside the Geotubes directly into the BTSF. The Bachelor site is drained by means of culverts, ditches and a pumping system to manage surface water from precipitation, run-off or exfiltration. Taking diversion ditches into account, the

drainage area outside the BTSF covers around 26.5 ha. The final effluent is situated to the north of the BTSF and runs off towards a tributary of Bachelor Lake. The annual volume of effluent reaches an average of 1,060,000 m^3.

Production of 800 tpd at the Bachelor site requires 190 workers.

3.4 Proposed situation

This section describes the principal changes proposed in relation to the current situation.

3.4.1 Mining method and explosives

Since the geology of the Moroy deposit is similar to that of Zone A of the Bachelor mine, no changes in mining methods are expected, including the anticipated ore/waste rock ratio (3:1), or in the use and quantity of explosives. The Moroy deposit will be mined by continuation of the current underground network of drifts.

3.4.2 Waste rock management

Bachelor and Moroy waste rock is mainly used as filler for mined stopes. Whenever possible it is used as construction material or for site restoration purposes. In this case, the waste rock will be stored on the temporary pile already authorized within the BTSF. Their classification as construction material as per the protocol in question (MENV, 2002) has not yet been completed. The waste rock generated at the Barry site will be partially recycled as construction material for the new access to the south of the Bachelor site, as well as to build BTSF dykes.

3.4.3 Ore storage and processing

3.4.3.1 Ore storage

The two existing ore piles will be used to store the ore from the Bachelor site. Preference will be given to ore from the Barry site being directly offloaded into the hopper. To cope with mining problems, three new temporary ore piles will be developed to store Barry ore. This development will require an extension of the Bachelor complex to the north. The piles will be linked by an unloading loop, with its path running along that of a new collection ditch, also to be constructed. The edge of a pine forest is located here on a rocky ridge that will have to be stripped and levelled (Plan 003). It is anticipated that a 1.6 ha area of forest will be cleared. The slope will be oriented towards the BTSF to direct drainage water into it.

3.4.3.2 Ore processing plant

Ore from the Barry and Bachelor sites will be processed alternately according to the current carbon-in-pulp process. The carbon treatment circuit and the refinery have enough capacity and do not need modifications. On the other hand, expansion of the plant is necessary, together with modifications relating to the handling of the ore as it will come from two different sources. The following sections briefly describe the main modifications planned.

3.4.3.2.1 Crushing, storage and grinding circuit

The Barry ore will be unloaded directly onto a coarse grizzly screen equipped with a hammer to break the pieces that are too large or frozen. The ore will fall into a hopper; it will be extracted by a plate feeder, then transferred by three conveyors to the current jaw crusher and ultimately reach the current product silos. This will be done by a simple modification of the current crusher's discharge conveyor.

Since the plant will significantly increase in capacity, it will be necessary to double ore storage before the grinding circuit to alleviate maintenance of the jaw crusher circuit. To do this, a second silo will be installed parallel to the current silo. To supply the silos alternately, a reversible conveyor will be installed to relieve the current silo supply conveyor. Finally, the silos will each be equipped with a plate feeder and a conveyor installed to feed the new semi-autogenous mill, which will replace the rod mill and be equipped with a new vibrating sieve. The lime (CaO) feed system will remain unchanged.

The fairly fine pulp will pass through the sieve by gravity to the current cyclone pump box, which will also receive the discharge from the two new ball mills. As in the previous circuit, the pulp will be pumped to hydrocyclone classifiers and the fine pulp (≈ 75 µm) will be transferred by gravity to the current waste sieve and from there to the current thickener. Two cyclones will have to be added to accommodate the additional production.

One notable modification to the crushing circuit is the addition of a gravity recovery circuit via Knelson concentrators. This will recover the particles of coarse gold, which accumulate in the circuits and in undesirable locations. The gravity concentrate (approximately 0.05% of mass) will be transferred to an accumulation tank, then processed regularly on a concentrator shaking table with reciprocal movement (Gemini brand or the equivalent).

3.4.3.2.2 Leaching and carbon-in-pulp circuit

The expansion and the increase in tonnage will cause a reduction in the pulp retention time throughout the circuit. It will therefore be necessary to replace the thickener with a larger-capacity model, to be installed outside.

Similarly, two new carbon-in-pulp tanks with their inter-tank screens and carbon transfer pumps will have to be installed inside. The safety screen at the end of the carbon-in-pulp circuit will also be changed for a larger-capacity model. Three new cyanidation tanks could be installed outside as needed. They will be constructed with solid foundations so that the solutions will be contained in case of a leak at the bottom of a tank.

3.4.3.2.3 Reagents

There are no changes in the reagents, apart from their consumption, which will increase in proportion to the tonnage.

3.4.4 Tailings management

The current tailings management concept – the piling of dry tailings – will allow the same BTSF footprint to be retained in the short term. By increasing the tonnage from 800 to 2,400 tpd, it is possible that the tailings will not be sufficiently consolidated and drained to be excavated and piled up quickly. Thus, it will not be possible to compact the tailings to a reasonable level, leading to stability and subsidence problems. Finally, with 8 Mt of tailings to be stored, the storage area will have to be expanded to meet legal flooding constraints and the structural capacity of the confinement structures. Management of tailings will therefore change from the storage of dry tailings to an optimized hybrid approach, combining conventional and dry-stacking methods for tailings and will enable tailings to be recycled as dyke construction material. The proposed concept means that the extension of the BTSF will remain within the same drainage basin.

A reconfiguration of the BTSF will be undertaken. According to BBA engineering (2018), the expanded pulp storage area will constitute a single cell, so that only two cells will be ultimately present on the site: the one that will be filled with the relocated dry-stacked tailings and a new cell, which will be approximately three times greater in area than the first cell. As far as water ponds are concerned, a south pond to be constructed will allow the recirculation of water to the ore processing plant, while a north pond will act as a sedimentation pond to take care of polishing before final discharge. Plan 002 illustrates the proposed reconfiguration.

3.4.5 Barry-Bachelor transportation toad

Ore will be transported from the Barry site in trucks running along the forest roads that were used when this ore was milled in the Bachelor plant between 2008 and 2010. The distance to be covered is approximately 110 km, including 87.5 km located in the territory under COMEX jurisdiction. Work is needed on the ore transportation road: this includes the clearing of brush from the road right-of-way, renovation of seven culverts and reconditioning of the rolling surface.

The route of the new southern access leading from the existing Barry-Bachelor transportation road to the Bachelor complex is presented in Plan 002. This 1.2 km segment bypasses the western side of the BTSF. It is anticipated that the crossing of two intermittent watercourses at their source will be required for the construction of this new access, which will involve the addition of two culverts. The absence of fish habitat in the aforementioned segments reduces the complexity of the work to be completed. There will be no encroachment of any wetland.

The projected use of the transportation road is based on the milling sequence envisioned, namely 30 consecutive days of ore from the Barry site, followed by a 10-day interruption during which ore from the Bachelor site will be milled. This sequence is based on the overall annual milling objective; it will be adapted from time to time to the Project's operational needs and constraints, as well as to the periods of the year requiring intensive road maintenance, particularly the thaw. This will mean that the ore milling cycles of the Barry and Bachelor sites could sometimes be shortened or lengthened over certain periods, resulting in occasional changes in trucking frequency.

Trucking of ore from the Barry site will be done day and night with 50 t trucks. Thus, for each typical 30-day cycle at the maximum production rate of 2,400 tpd, it is estimated that possibly 48 trips per day could occur. This cycle would be repeated after a break generally lasting 10 days. The projected average milling rate is approximately 1,500 tpd, at least during the first years of the Project, thus reducing the trucking frequency. Another factor that may reduce trucking frequency is the use of automated road convoys, as mentioned in Section 3.2.2. A road train of four trucks will ultimately reduce the number of daily trips to 12.

3.4.6 Power supply

With the increase in the production rate, electrical power consumption will increase in proportion. Consequently, Metanor will submit a request to Hydro-Quebec to increase the power supply to the Bachelor site via the existing Waswanipi power line, which would involve adding transformers at the plant to cover the new needs. It is assumed that the state of the existing Waswanipi line is adequate to support the increased power transmission.

3.4.7 Water management

The water circuit used for mining extraction will be similar, except for the addition of a recirculation pond. All industrial water leaving the recirculation pond will be treated before it is transferred to the sedimentation pond.

A change in the volume of mine water is not anticipated as the Moroy deposit operation will still be in the existing Bachelor mine de-watering drawdown cone. This water will continue being treated by the sedimentation pond.

Extension of the BTSF surface area will involve reworking of the drainage system to intercept clean water from the surrounding hills and return it to its original drainage basin, Bachelor Lake. The expanded BTSF ridge line will not extend into the neighboring Lake Auger drainage basin. No transfer of water between the drainage basins is therefore envisaged.

Ultimately, the drainage area outside the BTSF will be reduced, corresponding to the greater part of the Bachelor complex. Consequently, the overall hydraulic balance of the Project will be reduced as there will not be a greater inflow of water (precipitation and mine water) and the increase in the ore processing plant will generate an increase in the volume of water captured in tailings.

Despite the increase in the ore treatment capacity and quantity of sodium cyanide, the cyanide concentration in the final effluent will not change. To offset this increase and naturally reduce the cyanide, a recirculation pond will be created, upstream of the industrial water treatment plant, to increase water retention time; a second pond (sedimentation pond) will be enlarged downstream of the industrial water treatment plant to increase retention time. The industrial water treatment plant will operate full-time between May and November and at other times of the year if necessary; in the event of an increase in treatment requirements, Metanor will adjust the plant parameters accordingly.

A network of observation wells has gradually been set up on the Bachelor site over the years. In view of the fact that some of these structures will have been decommissioned, they will have to be replaced downstream of the new dykes.

3.4.8 Labour force

All-in-all, a total of 245 workers hosted at the Bachelor site will be required to produce 2,400 tpd for the Project. It should be pointed out that the Project allows mining activity to continue at the Bachelor site; without it, even the jobs tied to the original 800 tpd production would be lost.

3.4.9 Rehabilitation

A period of 18 months is anticipated for mine rehabilitation work. During and at the end of this period, the site will be made secure to guarantee the safety of the public and wildlife.

Due to the mode of management of the BTSF, it cannot be gradually rehabilitated. The dry tailing stacks and tailings cell will be rehabilitated at the end of the Project. The BTSF will be developed to allow the site to drain naturally towards the sedimentation pond's evacuation channel, without the accumulation of water elsewhere in the BTSF. The installations linked to water quality will remain onsite until the quality of surface water is compliant with environment discharge standards. The observation wells will remain in place for post-closure monitoring.

No piles of material will remain on the site. All the ore will be processed and waste rock used for rehabilitation purposes. Peripheral drainage of temporary ore piles will be achieved via a collector ditch that, at the time of rehabilitation, will be backfilled with inert material; the surface will subsequently be levelled and replanted. All the remaining material from the overburden pile planned at the northeast of the BTSF will be used for rehabilitation purposes.

Generally speaking, all buildings, infrastructures, dismantling scrap and sanitary installations not used for post-closure monitoring will be dismantled and removed: they will then be sent to an authorized disposal area or recycled; the sites will then be restored. A characterization will be carried out on soils near reservoirs that have contained petroleum or chemical products, as well as in other areas that may be contaminated.

Environmental monitoring of underground water, surface water, exfiltration water and the final effluent, as well as monitoring of the stability of structures and environmental aspects will be carried out for at least five years after termination of mining activities. Monitoring of the environment will be extended, if necessary. Agronomic monitoring will also be carried out on replanted zones for a period of six years.

4.0 Description of the environment

4.1 Delineation of study areas

The biophysical study area (BSA) includes the transportation road, borrow pits and the Bachelor site, as well as the receiving stream and entire Bachelor Lake. Whenever pertinent, the characterization of certain components is limited to the Bachelor site, called the proximity BSA. Map 002 illustrates these study zones.

As shown on Map 001, the socio-economic study area (SESA) includes Waswanipi and LSQ: it stops to the north of the Barry site, taking in the southern border of the application territory in Chapter 22 of the JBNQA EA. The SESA also encompasses the hamlets of Miquelon and Desmaraisville, Route 113, Lake Waswanipi and the trapping lands concerned by the Project.

4.2 Description of the biophysical environment

4.2.1 Climate and air quality

The BSA climate is subpolar and humid – it is characterized by a season of average growth (Gerardin et McKenney, 2001). The BSA is situated mid-way between two meteorological stations, Chapais 2 and Lebel-sur-Quévillon, the climate normals of which were calculated from 1981 to 2010 by Environment and Climate Change Canada (ECCC). These climate normals indicate an average annual temperature of 0.2°C at the Chapais 2 station and 1.0°C at the Lebel-sur-Quévillon station (ECCC, 2013). All stations combined, seasonal temperature variations are characterized by pronounced extremes, ranging from -43.3°C to 34.4°C. With an average annual value of 996 mm, the Chapais 2 station is the one that receives the most total precipitation (ECCC, 2013). Situated further west, the Lebel-sur-Quévillon station only receives 928 mm, a regional phenomenon where the eastern part is known to be less humid (MDDEFP, 2012).

The main atmospheric pollutants that will be generated by the Project's activities are the total suspended particulate matter (TSPM), fine particles under 2.5 µm in diameter ($PM_{2.5}$), as well as metals and metalloids. Modelling has been carried out to simulate the impact of the Project on air quality (EGS, 2019).

4.2.2 Geology and sensitive zones

The Bachelor site mines a gold deposit associated with a late felsic pluton called O'Brien Pluton. It is described as being a granite and granodiorite porphyry with biotite and hornblende. It also contains lamprophyry and kimberlite dyke. The massif crosses the contact between two units of volcanic rock. The four major ore zones that can be mined on the Bachelor site are as follows: Principal Zone, Zone A, Zone B and Moroy Zone.

Up to now, the Principal Zone has contributed 90% of the ore mined at the Bachelor site. Zone B is interpreted as being later than the Principal Zone and presents a similar, stronger alteration than the latter. Zone A is visually distinct from Zone B and the Principal Zone as it is highly altered in terms of hematite and shearing. It has a lower pyrite mineralization, ranging from slight traces to 7% fine, cubic pyrite. The Moroy Zone much resembles Zone A as it presents hematite alteration, albeit more moderate, and fairly moderate silica alteration.

As far as the soft deposits of the Bachelor site are concerned, the ground capping the BTSF mainly consists of glaciolacustrine deposits, undifferentiated till and organic deposits (MFFP, 2017). There is a rocky outcrop to the west of the installations. To the north of the BTSF where the height is to be raised, the ground is of an organic clay nature. Fine-grain materials such as clay, silt or fine sand form highly porous ground with low water conductivity. Therefore they retain water easily but drainage is difficult. To

the south of the BTSF where an extension is planned, the ground consists of glaciolacustrine deposits of a clay type but, on the surface, the latter alternate with undifferentiated till.

The general nature of the ground fosters water retention, which increases interstitial pressure, saturating the ground, increasing its weight and, as a result, increasing the risk of ground mobilization. Geotechnical investigations are continuing at the Bachelor site to pinpoint the sensitive areas of this type and manage the risks posed.

4.2.3 Hydrography and hydrology

The Bachelor site is situated close to the watershed divide of two lakes. All site activities are currently located within the Bachelor Lake drainage basin, which constitutes the receiving environment for the effluent. The outflow from Bachelor Lake becomes the Bachelor River, which flows towards Waswanipi Lake after a fairly winding course of 31 km. In detail, the final effluent runs through a short channel to meet one of Bachelor Lake's five tributaries that we call the receiving stream, stretching over a distance of 4.3 km.

The southern part of the Bachelor site straddles the Auger Lake drainage basin. It is proposed that development work takes place (dyke and transportation road) without diverting the water. As far as the Barry-Bachelor transportation road is concerned, it mainly crosses the drainage basin of the Opawica and O'Sullivan Rivers.

Historic regional climate data has proved sufficient to calculate flood flow rates and obtain a portrait of the receiving stream's water system. Reference station hydrographs show that the flood level normally peaks in May, while the most severe low-water point occurs in winter, in March. A local hydrology survey has shown that the current contribution of effluent to the receiving stream's flow rate is primarily perceptible in summer and autumn: however, under no circumstances does the normal flow increase more than 17% above original conditions. As far as low-water points are concerned, adding the effluent reflects a reduction in their severity (Enviréo-Conseil inc., 2018a).

4.2.4 Hydrogeological context

From the information acquired near the BTSF, groundwater is generally found at a depth of less than 1 m from the ground surface. In this sector, data indicates that the hydrostratigraphic sequence is as follows, starting from the surface: mining tailings, clay, sand, till and rock (Leblanc et al., 2018).

A digital flow model was developed to evaluate whether the percolation rate at the base of the BTSF is compliant with the design criterion of 3.3 l/sq.m. per day. This study, based on the hydrogeological properties of the site and the tailings deposition plan, concludes that "for the loads used and the flows calculated in line with the 3.3 L/sq.m. per day criterion, between 72% and 93% of the surface of the proposed tailings facility is compliant". The zones where this criterion is not met are associated with the absence of clay (Leblanc et al., 2018).

Since Metanor started operations, the quality of groundwater has been monitored annually. Despite extensive result data, trends cannot yet be distinguished.

4.2.5 Surface water and sediment quality

Various records kept over more than a decade enable the characterization of the receiving environment in terms of the quality of surface water and sediment. This draws both from previous impact assessments and from environmental effects monitoring (EEM) studies, relating to the receiving stream as well as Bachelor Lake (Enviréo Conseil, 2011; Enviréo Conseil, 2015; 2018a). Monitoring includes the exposed zone (EZ) and reference zones (RZ). Map 004 indicates the locations of these sampling zones.

4.2.5.1 Surface water

The quality of surface water is generally good in the receiving environment. A notable difference can be observed with the concentrations of copper, for which the recommended levels have been exceeded for several samples in the EZ. Similarly, most of the samples exceed the criteria for free cyanide stipulated by the Canadian Council of Ministers for the Environment (CCME) and the MELCC. The EZ is the only area that has experiences at least one exceedance or non-conformity for the level of cadmium and nitrates.

On the other hand, the aluminum and iron concentrations observed in the RZ were higher than those of the EZ. In these cases, all samples exceeded the CCME criterion for the protection of aquatic life [long-term exposure]. Also, it is only in the tributaries serving as reference that an exceedance or non-conformity was detected for pH, alkalinity and lead levels.

No acidification of the aquatic habitat seems present downstream of the final effluent discharge point. As far as hardness, alkalinity and pH are concerned, the values are even higher in the EZ than in the RZ.

4.2.5.2 Sediment

By comparing the results of the above studies, four metals show recurring criteria exceedances in EZs: cadmium, chromium, copper and zinc. For most of them, these concentrations are close to the background level; for zinc, the previous process for extracting ore may be responsible (Genivar, 2011).

4.2.6 Vegetation

The vegetation analysis covered the nearby BSA, 362.5 ha in area. Field surveys show that aquatic environments cover 25.4% of this area. Treed swamp is the type most commonly found but the tree stratum is sometimes absent due to recent logging. Black Spruce (*Picea mariana*) dominates the tree stratum, when present. The shrub stratum mainly consists of Labrador Tea (*Rhododendron groenlandicum*) and Sheep Laurel (*Kalmia angustifolia*). In bogs, the Leather Leaf (*Chamaedaphne calyculata*) is dominant. Mosses (*Sphagnum sp.*), Creeping Dogwood (*Cornus canadensis*) and sedge (*Carex sp.*) were observed as the main components of the non-woody stratum.

As far as land ecosystems are concerned, Black Spruce/Balsam Fir constitutes the most abundant forestland population. Balsam Fir/White Birch and Trembling Aspen/Black Spruce are also notably present. Field surveys have indicated a species richness of 66 species of plants. No species at risk were found in the local BSA. Of the 20 species with a certain probability of occurrence, only 2 might have a presence potential deemed to be average. This is the Wild Comfrey (*Andersonglossum boreale*), which grows on rocky ground or steep slopes in fir forests with openings in the canopy, as well as the Bladderwort (*Utricularia geminiscapa*), which grows in aquatic habitats.

4.2.7 Terrestrial wildlife

No mention was made of herpetofauna in the BSA when field studies were undertaken for Metanor. According to literature, there is a medium or high likelihood of six species of amphibians or reptiles being found on the BSA. These are salamanders, frogs, American Toads (*Anaxyrus americanus*) or the Common Garter Snake (*Thamnophis sirtalis*). According to research, no species at risk in this population is to be found across the BSA.

The results from 14 plots in the Second Atlas of Quebec Breeding Birds (2010-2015) indicate a diversity of 91 species liable to nest in the BSA. Incidental observations and a study based on the listening points technique (carried out for the Project in June 2018) have enabled more than half this population to be observed in the local BSA. Of 10 at-risk species with potential presence, 3 were identified: the Common Nighthawk (*Chordeiles minor*), the Sand Martin (*Riparia riparia*) and the Rusty Blackbirde (*Euphagus carolinus*). Nesting could only be confirmed for the SandMartin after discovery of a colony in activity within the borrow pit currently in operation.

Several species of chiropterans and small mammals live in the forest and other BSA biotopes. A study carried out in the sectors of Desmaraisville and Waswanipi in 2005-2006 recorded the presence of six species of small mammals, including the Rock Vole (*Microtus chrotorrhinus*), a species at risk with high presence potential.

As far as chiropterans are concerned, a regional study in 2012 determined that five species of bats identified as potentially present are at risk. In view of the absence of caves or abandoned pits, they could not overwinter there. However, they could reproduce in the mature forests bordering the BTSF.

A total of 17 species of furry mammals could be present on the BSA. Trapping statistics indicate that 10 species are harvested in a beaver reserve that includes the local BSA, including the American Marten (*Martes americana*) and beaver, which appear to be of interest to the fur market. The Least Weasel (*Mustela nivalis*) is a species at risk and is possibly present in the BSA.

Hunting data shows that two mammals are targeted in Hunting Zone 17, which is part of the BSA: the Black Bear (Ursus americanus) and the Moose (Alces alces) (MFFP, 2018). Both the bear and moose populations are apparently on the rise. No hunted mammal species has a specific status in the BSA. There is no likelihood of caribou being present in the territory.

4.2.8 Aquatic fauna

A total of 17 fish species were inventoried in Bachelor Lake or its tributaries historically and during recent scientific fishing. No species with status was inventoried, while 9 are considered of interest for sport fishing. At Bachelor Lake, the White Sucker (*Catostomus commersoni*), Northern Pike (*Esox lucius*), the Yellow Perch (*Perca flavescens*) and Walleye (*Sander vitreus*) are the fish most frequently found. The Lake Whitefish (*Coregonus clupeaformis*) has only been caught part of the time. Although spawning grounds were not observed directly in Bachelor Lake, most of the inventoried species probably breed within its drainage basin.

Up to now, the diversity of fish populations does not differ between the receiving stream or Bachelor Lake bay into which it flows, compared with RZs. Finally, the majority of fishing operations show a greater number of fish in EZs than in RZs. However, some effects on fish health through monitoring of sentinel species have been detected in the liver, but the data do not allow clear conclusions. The only effect detected on the habitat is related to a possible downturn trend in the benthic community in the nearby exposed zone in relation to the reference environment (RZ1). Moreover, the effect is reduced in Bachelor Lake compared with the receiving stream. This very low intensity effect is moreover limited to the bay into which the receiving stream flows and not to the entire lake.

4.2.9 Protected areas

Data obtained through a request to the Quebec Register of Protected Areas indicate that there are no exceptional forest ecosystems or fauna habitats in the BSA. The BSA around the Barry-Bachelor transportation road does however straddle the edge of biological refuge number 0876R023, close to the Pierrefonds River, and to the biological refuge project number 08763R009 on the north shore of Auger Lake. Although not included in the BSA, the planned Lake-Waswanipi aquatic reserve is part of the SESA. It is situated approximately 35 km southwest of Waswanipi and 50 km northeast of the municipality of LSQ.

4.3 Description of the human environment

4.3.1 Governance

The EIJBRG, succeeding the former Municipalité de Baie-James effective January 1, 2014, is a parity government uniting the Jamesians and the Crees. It is the sole regional government in Quebec and can declare its power as a regional county municipality. The EIJBRG's jurisdiction applies exclusively to the Category III lands created under the JBNQA situated within the limits of its territory. Category III lands are public lands where the beneficiaries of the JBNQA hold exclusive trapping rights (subject to exceptions) and non-exclusive hunting and fishing rights. They do not need a licence to exercise these rights (GREIBJ, 2018).

The EIJBRG's territory encompasses the municipalities of Chapais, Chibougamau, LSQ, Matagami and Eeyou Istchee James Bay, the localities of Valcanton, Radisson and Villebois, the hamlets of Desmaraisville and Miquelon, and the township of Joutel. It encompasses or borders the Cree villages (Chisasibi, Eastmain, Mistassini, Nemaska, Oujé-Bougoumou, Waskaganish, Waswanipi, Wemindji and Whapmagoostui).

4.3.2 Socio-economic aspects

The forecasting data of the Institut de la Statistique du Québec suggests that the non-Indigenous population situated in the territory encompassed by the EIJBRG would decrease considerably to 11,203 people (- 25.2%) around 2031. On the other hand, population increases of 32.8% for all of the Cree villages of Eeyou Istchee are expected for the 2006-2031 period (ISQ, 2009). Indeed, in 2015, this territory's non-Indigenous population was estimated at 14,097 people, and thus had decreased from the population of 14,284 established by the previous census in 2011, while the Eeyou Istchee population was estimated to have increased at the same time (estimated population of 17,468 compared to 16,528 in the 2011 census) (ISQ, 2016).

The following sections provide some socio-economic characteristics of the communities of the SESA. Most of the statistics in this section are taken from the 2016 Census of Statistics Canada.

4.3.2.1 Cree First Nation of Waswanipi

The Cree village of Waswanipi is situated on lands reserved for the Crees, on Route 113, along the Waswanipi River, 30 km northeast of the Bachelor site.

The members of the CFNW hold a total of 52 traplines, which cover an area of 32,250 km^2(Genivar, 2011).

Waswanipi had a population of 1,760 in 2016. The population is young, the average age being 28 (compared to 32 for the Nord-du-Quebec) and is increasing, with a growth of 28.8% expected from now to 2031.

The Council of the CFNW is composed of a chief, a vice-chief and six councillors.

4.3.2.2 Town of Lebel-sur-Quévillon

LSQ is situated on the EIJBRG territory, along Route 113, on the shores of Quévillon Lake, and is 95 km southwest of the Bachelor site.

The population of LSQ was 2,187 individuals in 2016. The average age is 42 (compared to 32 for the Nord-du-Quebec), and the population is decreasing, with a decline of 29.5% expected from now to 2031.

The LSQ municipal council is composed of a mayor and six councillors.

4.3.2.3 Hamlets of Desmaraisville and Miquelon

Desmaraisville and Miquelon, as hamlets, are districts without a local council, administered by the EIJBRG. These hamlets do not have specific units for federal or provincial census purposes.

Desmaraisville is situated 3.5 km northwest of the Bachelor site. Its population amounted to around 30 inhabitants in 2011 (Genivar, 2011), but according to the information collected from the inhabitants during public consultations conducted by Metanor, the population was only 7 inhabitants in 2018.

Miquelon is situated close to the O'Sullivan River, where crossed by Route 113, around 25 km southwest of the Bachelor site.

4.3.3 Land use by the Waswanipi Crees

The following information on the traditional practices of the Waswanipi Crees and the areas they use was provided by the tallymen consulted in the context of the IA. Land use areas are illustrated in Map 006.

The main lakes fished by users of the W24A land are Pusticamica Lake, Waswanipi Lake and Malouin Lake. Other users also fish in Nicobi Lake and Auger Lake, as well as Lichen Lake and its tributaries. Users of W24D land fish for trout in the Périgny River and Lake. On Lot 19, users fish in the Loutres lake.

Moose and geese hunting grounds are located in the following sectors, amongst others: Panache River (spring), along the O'Sullivan and Périgny Rivers (spring and autumn) and the Waswanipi, Pusticamica and Malouin Lakes (spring and autumn). Moose are also hunted along the Barry-Bachelor transportation road (autumn), Route 5000 and on trapping grounds. The users' hunting areas in Lot 19 are kept confidential.

The northeast sector of the W25A land is a favourable site for berry picking. On Lot 19, medicinal plants are picked in the northern sector of Loutres Lake and along one of its tributaries near the Barry site.

The areas valued by users of the land include the Panache River camp on W25A land, the sector of the main O'Sullivan River camp on W24D land, the Malouin Lake camp and three spring water collection points on W24A land, a walleye spawning area in the Loutres Lake, as well as the mouth of the Macho River in Loutres Lake on Lot 19.

4.3.4 Land use by other communities

Several non-Indigenous people have camps in the Thubière Lake sector on the W25A trapping land. Five non-Indigenous camps are situated on W24D land. As far as W24A land is concerned, most of the non-Indigenous people fish Malouin Lake and do not have permanent camps. On Lot 19, fishermen use the lake situated near the Barry site. On W21 land, Bachelor Lake is a venue for non-Indigenous visitors during the summer. The lake also has a float-plane base, mainly serving the six outfitters in the SESA.

The main known community use site in the SESA is the rustic campsite at Lake Waswanipi.

5.0 Project impact on major issues

5.1 Impact analysis methodology

The methodological approach for assessment of impact classifies the following: Project activities by phase, according to whether they are existent or new; the sources of impact resulting from each activity and environmental components.

Next, an interrelations matrix shows negative or positive links between the sources of impact and environmental components. Links considered significant are highlighted. The premises for assessing the magnitude of relationships are explained in the IA. Impact analyses focus on significant relationships.

As required by the Directive, impact analysis is based on major issues at stake. These issues are determined using explicit selection criteria. Every issue is defined by identifying the environmental components in question.

Then, the criteria taken into account to describe and assess the magnitude of potential impact on each major issue are defined. These criteria are as follows: nature, beneficial/detrimental aspect, degree of certainty, intensity, spatial scope, timescale and reversibility. The assessment of magnitude considers current mitigation measures from the outset.

Finally, specific mitigation measures are proposed to reduce the anticipated magnitude of negative impact. In the same way, optimization measures are emphasized whenever possible to increase the extent of positive impact.

Note that current mitigation measures are also proposed for relationships considered as insignificant in the interrelations matrix, in a spirit of corporate responsibility for protecting the environment.

5.1.1 Project activities and sources of impact

The main activities proposed in the context of the Project are broken down in terms of existing or new activities. It should be emphasized that the existing situation is based on the level of production currently authorized (800 tpd), even if Bachelor ore extraction and processing has been suspended since summer of 2018.

Biophysical and socio-economic sources of impact arising from the activities proposed are classified into four groups:

- Current sources of impact that will be extended in the context of the Project, the nature and emission rate of which remain unchanged;
- Sources of impact that will continue, with an increase in the emission rate;
- Sources of impact that will continue, with a decrease in the emission rate;
- New sources of impact caused by the Project.

5.1.2 Determination of interrelations

The interrelations matrix presented in Table 5-1 indicates relationships between sources of impact and physical, biological and human environment components. For the sake of concision, certain environmental components have been combined.

Table 5-1. Interrelations matrix between sources of impact and environmental components

Phase	Activity	Type of impact source	Component in the biophysical environment										Component in the human environment							
			Climate	Air quality	Surface water and sediment quality	Sensitive areas and soil stability	Groundwater quality	Terrestrial ecosystems and flora	Wetlands and water bodies	Fish habitat	Terrestrial wildlife (birds, bats and small mammals)	Species at risk	Population and economy	Land access	Hunting and trapping (affected mammal populations)	Fishing (fish populations)	Gathering	Services and infrastructure	Safety	Heritage and archaeology
Construction		**Existing, unchanged rate**																		
	Expansion of the ore processing plant	Vehicle traffic and refuelling	-	-							-									
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Existing, increased rate																		
	Improvement of the transportation road	Grading	-	-	-					-				+	-		-	+	+	
		Vehicle traffic and refuelling	-	-				-			-			-	-		-		-	
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+		-	-	-			
	Construction of a new southern access road and expansion of Bachelor complex	Vehicle traffic and refuelling	-	-							-									
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+		-	-	-			
	Redevelopment of the ore processing plant	Labour and purchasing goods/services											+		-	-	-			
	Expansion of the BTSF	Vehicle traffic and refuelling	-	-							-									
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+		-	-	-			
		New																		
	Improvement of the transportation road	Brush clearing	-	-				-		-	-/+	-		+	-/+		-	+	+	
		Road surface improvement (borrow pit material)	-	-							-	-		-/+				+	-	
		Works in a water/wetland environment	-		-			-	-	-	-	-				-/+			+	-
	Construction of a new southern access road and expansion of Bachelor complex	Deforestation	-	-	-			-			-	-			-					
		Stripping, excavation and earthworks	-	-	-			-			-	-								-
		Blasting	-	-											-					
		Works in a water/wetland environment			-			-	-		-	-								-
		Use of waste rock and borrow pit material	+		-							-								
	Redevelopment of the ore processing plant	Redevelopment of the plant and installation of new equipment																+		

Phase	Activity	Type of impact source	Component in the biophysical environment										Component in the human environment							
			Climate	Air quality	Surface water and sediment quality	Sensitive areas and soil stability	Groundwater quality	Terrestrial ecosystems and flora	Wetlands and water bodies	Fish habitat	Terrestrial wildlife (birds, bats and small mammals)	Species at risk	Population and economy	Land access	Hunting and trapping (affected mammal populations)	Fishing (fish populations)	Gathering	Services and infrastructure	Safety	Heritage and archaeology
Operations		Excavation	-	-	-															
	Expansion of the BTSF	Deforestation	-	-	-			-	-		-	-			-					
		Stripping, excavation, earthworks and placement of an overburden pile	-	-	-		-	-	-		-	-								-
		Placement and raising of dikes				-						-		-	-		-			
		Placing drainage ditches			-				-		-	-								-
		Existing, unchanged rate																		
	Moroy ore extraction	Use of explosives	-	-			-													
		Mine tunnel development																		
		Dewatering			-															
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials					-													
		Labour and purchasing goods/services	-										+							
	Management of waste rock and Moroy ore	Vehicle traffic and refuelling																		
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials					-													
		Labour and purchasing goods/services											+							
		Location of final discharge			-				-											
	Management of the camp and related services	Sanitary water management			-															
		Existing, increased rate																		
	Transport of Barry ore to the Bachelor site and unloading of Barry ore	Grading	-	-						-				+				+	+	
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+		-	-	-			
	Machining of the Moroy and Barry ores	Energy supply	-																	
		Crushing and milling (air)		-							-	-								
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+		-	-	-			
	Tailings management	Discharge quality and quantity (final effluent)			-					-					-/+	-				
		Labour and purchasing goods/services											+		-	-	-			
		Spigotting of pulped tailings		+	+							+								

Phase	Activity	Type of impact source	Component in the biophysical environment										Component in the human environment							
			Climate	Air quality	Surface water and sediment quality	Sensitive areas and soil stability	Groundwater quality	Terrestrial ecosystems and flora	Wetlands and water bodies	Fish habitat	Terrestrial wildlife (birds, bats and small mammals)	Species at risk	Population and economy	Land access	Hunting and trapping (affected mammal populations)	Fishing (fish populations)	Gathering	Services and infrastructure	Safety	Heritage and archaeology
	Management of the camp and related services	Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+		-	-	-			
		New																		
	Transport of Barry ore to the Bachelor site and unloading of Barry ore	Vehicle traffic and refuelling	-	-		-		-	-		-	-		-	-		-		-	
		Brush clearing	-	-				-	-		-/+	-/+		+	-/+		-	+	+	
	Processing of the Moroy and Barry ores	Geochemical properties			-	-														
	Tailings management	Water management			-	-	-													
		Existing, decreased rate																		
	Processing of the Moroy and Barry ores	Crushing and milling (noise)		-																
	Tailings management	Vehicle traffic and refuelling	+	+																
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	+	+																
		Dry stacking of tailings	+	+	-										+					
Closing		**Existing, unchanged rate**																		
	Dismantling and restoration of the site	Restoration of mine tunnels																		
		Water management			-	-	-		+	-						-			- / +	
		Existing, increased rate																		
	Dismantling and restoration of the site	Vehicle traffic and refuelling	-	-							-	-		-	+/-		-		-	
		Maintenance of machinery and equipment / Management of residual materials and hazardous materials	-	-																
		Labour and purchasing goods/services											+			-				
		Presence of site remains										+		-	-				-	
		Revegetation	+	+	+	+		+	+		+	+		-	+	+		-		

Note(s)

+	-	Significant interrelation (positive or negative)
+	-	Insignificant interrelation (positive or negative)
		No interrelation

5.1.3 Identification of major issues

Major issues have been determined on the basis of the following criteria:

- Significance for the stakeholders consulted;
- Protection by federal or provincial law;
- Significance for the scientific community;
- Directive requirements.

The Directive for the execution of an assessment of the impact on the environment, "Determination of the Issues at Stake" section (MDDELCC, 2016a), and experience gained during the construction and operation of the Bachelor mine have also helped with the selection of issues.

Table 5-2 presents the issues selected as being major. They were chosen so as to include each of the environmental components having significant interrelation with a Project activity.

Table 5-2. Major issues identified

Issue	Definition / explanation	Affected component
Climate change	Increased global average surface temperatures caused by the massive use of fossil fuels that generate GHGs	Climate
Conservation of air quality at the Bachelor site	Based on the MELCC index which takes five contaminants into account (ozone, particulate matter, sulfur dioxide, nitrogen dioxide and carbon monoxide)	Air quality
Protection of Bachelor Lake's water resources	Includes renewable water reserves, in terms of quantity and quality	Surface water and sediment quality Groundwater quality
Conservation of wetlands and water bodies	Wetlands and aquatic environments are ecosystems of great ecological value, home to a wide diversity of flora and wildlife	Wetlands and water bodies
Preservation of biodiversity	Biodiversity covers all of the species and ecosystems in a specific place, as well as the ecological processes of which they are part.. In the context of the IA, it concerns species confirmed as having or likely to have an at-risk status.	Terrestrial wildlife (birds, bats and small mammals) Wildlife species at risk
Maintenance of healthy fish populations in Bachelor Lake	Fish populations are of great ecological and socio-economic importance to Bachelor Lake anglers, many of whom have holiday camps around the lake	Water and sediment quality Fish habitat Fishing
Preservation of wildlife resources	The population of hunted mammals, such as moose and bears, is of great socio-economic importance to hunters in the region. Trapping is an important traditional activity.	Hunted and trapped mammals

Issue	Definition / explanation	Affected component
Continuity of land use	The transport route follows public forest roads. In this sense, the ability to maintain satisfactory access for all users is important. Nuisances caused by the Project may also compromise activities in the forest.	Access to the territory Hunting and trapping Gathering Safety/security
Socio-economic benefits	Socio-economic benefits include income and skills building as a result of jobs and contracts, the use of these revenues, and the taxes and royalties paid. The benefits also include investments in the community.	Population and economy Services and infrastructures

5.2 Potential impacts on the biophysical environment

The following sections summarize potential impact on issues related to the biophysical environment.

5.2.1 Climate change

During all the phases of the Project, the use of diesel fuel by trucks and gas by light vehicles will lead to the emission of three main greenhouse gases (GHGs) into the atmosphere: carbon dioxide (CO2), methane and nitrous oxide converted into CO2 equivalent (CO2 eq).

On average, the Project will emit an annual 6,192 tm CO_2 eq for the lifecycle of the Project. GHG emission estimates covering the entire life of the Project will be approximately 74,313 tm CO_2 eq.

The operating phase will generate 82% of the total GHG emission during the Project lifecycle, two-thirds of which will be linked to trucking the ore.

According to the national GHG emission report for 1990-2016 (ECCC, 2018a), total GHG emissions in 2016 for the whole of Canada would reach 704 Mt of CO2 eq, i.e. 19.4 tm CO_2 eq per inhabitant (ECCC, 2018b). In 2016, mining activities, classified in the "heavy Industry" category emitted the equivalent of 75 Mt of CO_2 eq (ECCC, 2018c). The estimated annual contribution of the Project amounts to 0.008% of the emission linked to this sector of activity. Annual emissions from Project activities represent 0.0009% of total emissions on a federal scale. This indicates that the contribution from emissions linked to the Project is low.

5.2.2 Conservation of air quality at the Bachelor site

Atmospheric dispersion modelling results indicate that, according to the assumptions made, all standards are met. To be more precise, the results indicate that:

- Concentrations (e.g. PST, $PM_{2.5}$, CaO) decrease rapidly with the distance;
- Standards are met for the entire zone assessed and the discreet receptors modelled;
- Comparison with the preliminary risk assessment threshold for lime shows exceedances but with low frequency for the threshold over one hour, mainly caused by the threshold modelling approach over a year;
- Particle and metal emissions are mainly due to suspension caused by vehicles and, when present, wind erosion of the BTSF;
- Lime emissions are caused by one source, the lime silo.

5.2.3 Protection of Bachelor Lake's water resources

The geochemistry of tailings resulting from the processing of three different ores and expansion of the BTSF has the most likelihood of affecting the final effluent and therefore the quality and quantity of water in Bachelor Lake.

Based on an average annual water assessment, the final volume of effluent will be reduced by 5% following the expansion of the BTSF, due to an increase in the production of tailings, resulting in water retention. This reduction is considered negligible and should not have any impact on the quality of water of the final effluent or, ultimately, the quality and quantity of Bachelor Lake water.

By processing the new Barry and Moroy ore in the Bachelor site ore processing plant, the production of tailings possessing geochemical characteristics are anticipated to possibly differ from those of Bachelor tailings. Consequently, the quality of the supernatant generated in the BTSF and the quality of the final BTSF effluent could change.

To this effect, several analyses (AGP, elementary composition of metals, leaching of metals (LM)) were conducted on several samples of the three minerals (Barry, Moroy and Bachelor) and available samples of waste rock and tailings.

A summary of analysis results is presented in Table 5-3. The analyses are based on the following two regulatory references to monitor the AGP of the various samples:

- Directive 019 (D019), which classifies a sample with an AGP if 1) the total sulfur in the sample is over 0.3 % and 2) the NP/AP ratio is under 3;
- MEND (Price, 2009), which classifies a sample with an AGP if the NP/AP ratio is under 2.

Table 5-3. Summary of the results of analyses of ore, waste rock and tailings from Bachelor, Moroy and Barry

Parameter		Barry ore	Moroy ore	Bachelor ore	Barry waste rock	Moroy waste rock	Bachelor waste rock	Barry tailings / Moroy tailings	Bachelor tailings
AGP (D019)		83% of the samples were non-AGP	48% of the samples were non-AGP	34% of the samples were non-AGP	94% of the samples were non-AGP	84% of the samples were non-AGP	71% of the samples were non-AGP	not available	73% of the samples were non-AGP
Metals liable to leach	**SPLP**	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations (**Al, As** and **Mn**) exceeded drinking water criteria for most of the samples	• Leachate concentrations did not exceed the criteria in Table 1, D019 • **Al** leachate concentrations exceeded drinking water criteria for most of the samples	• Leachate concentrations did not exceed the criteria in Table 1, D019 • **Al, Se, As, Ba** and **Mn** leachate concentrations exceeded drinking water criteria for most of the samples and **Ag, Ba, Cu** and **Zn** concentrations exceeded the surface water resurgence criteria in a few samples	• Leachate concentrations did not exceed the criteria in Table 1, D019 • **Al** leachate concentrations exceeded drinking water criteria in all the samples • A study of seven samples of Barry waste rock showed that they are classified in Category II, which allows them to be used as protective plates and foundations in unsurfaced roads (GCM Consultants, 2018)	• Leachate concentrations did not exceed the criteria in Table 1, D019 • **Al** leachate concentrations exceeded drinking water criteria for most of the samples	• Leachate concentrations did not exceed the criteria in Table 1, D019 or the infiltration criteria • Criteria relative to drinking water were exceeded for **Al, As, Ba** and **Mn**	not available	• Leachate concentrations from two samples were either below the laboratory detection limit or all comparison criteria
	TCLP	not available	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations (**F, Al, Cr, Mn, Pb, Se** and **U**) exceeded drinking water criteria in a few samples	not available	not available	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations (**Mn, Zn** and **Al**) exceeded drinking water criteria in a few samples	not available	not available	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations of **F, Al, Ba, Cu, Mn, Ni** and **Zn** were higher than drinking water and infiltration criteria
	CTEU-9	not available	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations (**F, Al, Mn** and **Mo**) exceeded drinking water criteria for most of the samples	not available	not available	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations (**Al, F, Mn** and **Mo**) exceeded drinking water criteria for most of the samples	not available	not available	• Leachate concentrations did not exceed the criteria in Table 1, D019 • Leachate concentrations of **F** are higher than drinking water criteria in the two samples analyzed
	Kinetic tests	not available							• Acid/base determination analyses indicate that the two samples are non-AGP as per D019

Bachelor and Moroy waste rock will be used as filler for mined stopes and as dyke construction material. According to the test results available, Moroy or Bachelor waste rock does not present a high risk of LM but their classification as construction material as per the protocol in question (MENV, 2002) has not yet been completed.

The tailings samples available, taken from the Bachelor plant, may have included tailings from Moroy and various Bachelor ore zones over the last five years. The analysis results for these samples show a low AGP.

Some Bachelor and Moroy ore data suggests an AGP for their tailings but tailings samples generally indicate low acid mine drainage (AMD) potential based on NP/AP ratio values. Site geologists have indicated that, when mined, the Moroy ore is extracted from narrow veins and is around 25% diluted with waste rock. Comparison of average neutralization potential (NP) and acidification potential (AP) values for the ore and tailings has shown that the NP values between the ore and tailings were generally similar. Generally speaking, the median AP values in tailings are below the average values for Bachelor and Moroy ores, which suggests that a few relatively higher-content samples might have led to overestimation of the average calculated.

To more completely assess the potential effect of apparent dilution on results from the ore, the NP/AP values for Bachelor and Moroy ore samples were recalculated to take a dilution of 25% into account for waste rock at the time of extraction, resulting in an average NP/AP ratio of 3.7 for 48 tailings samples.

5.2.4 Conservation of wetlands and water bodies

Tree clearing, stripping, excavation and drainage will take place at the time of construction, leading to a total loss of a wetland area of 4.76 ha. Only one high-value wetland, two average-value wetlands and five with a low value will be totally or partially lost. The greater majority are treed swamps, with the exception of one wetland which is a reed type of swamp. Some treed swamps had already been disturbed by logging.

At the time of the closing phase, the BTSF will have reached its maximum capacity. Its ecological restoration could be implemented to create a terrestrial ecosystem resembling that of the surrounding natural environments. Only a few open-water lakes of anthropogenic origin are liable to remain around spillways.

Moreover, if one of the wetlands and one of the complexes affected have a high value, these environments are very common, both on a local (local BSA) and regional level (CIC, 2009).

5.2.5 Preservation of biodiversity

A number of works required to be done during the construction phase will result in the loss of wildlife habitat. For avian fauna, this will affect several bird species that frequent all the natural environments inventoried, mainly composed of forest and wasteland biota. Many of these species are sparrows. At critical nesting times, incidental loss is possible within the meaning of the *Migratory Birds Convention Act, 1994*. The impact will be similar for protected chiropterans breeding in mature trees in forested areas liable to be cleared. The area of lost natural habitats is estimated at close to 33 ha.

Field surveys confirmed the presence of three species at risk, all birds: Common Nighthawk (SLDTV and Threatened), Rusty Blackbird (SLDTV and Special Concern) and the Sand Martin (Threatened).

Analysis of the potential presence of other species with habitat-specific status suggests it is likely that chiropterans or small mammals breed around the BTSF.

Ecological restoration could recreate habitats favourable to the Nighthawk and Blackbird. The closure of the borrow pits will drive the existing swallow colony away, as the flattening of the slopes means the loss of the steep slopes they favour.

5.2.6 Maintenance of healthy fish populations in Bachelor Lake

Work to expand the BTSF should not have a negligible effect on the quantity of discharge emitted daily by the final effluent and, therefore, on the total dilution of the latter at the mouth of the receiving stream and in Bachelor Lake. In fact, the average annual volume of final effluent is currently 2,039,320 cu.m. and will be reduced to 1,936, 506 cu.m.. Note that the species of fish most sought after are the sturgeon, the walleye, sauger, pike, whitefish, burbot and trout, mainly found in Bachelor Lake where dispersion is extensive and not in the receiving stream where dilution of the effluent is lower. It is assessed that the final effluent only makes up a very low percentage of the volume of water in the Bay EZ, which corresponds to the southwest sector of Bachelor Lake (Map 004).

All-in-all, by keeping to the current high level of dispersion of the effluent discharge into Bachelor Lake, impact on sport fishing, subsistence and their health should not increase. It is possible that certain contaminants lead to bioaccumulation in the flesh of fish. However, studies to measure the various contaminants in the flesh of fish in lakes exposed to mining discharge show that heavy metal and organochlorine content do not exceed Canadian Health directives for the sale of fish products, except for the mercury content (Laliberté, 2004; Laliberté, 2008).

The current extent of the effects of discharge on fish populations in Bachelor Lake is therefore very low or even unmeasurable. Moreover, the species for which low effects have been documented are not species fished. No acidification of the aquatic habitat seems present downstream of the final effluent discharge point or is even likely to be feared in the future, given the slight alkaline pH of the discharge and continued monitoring at the final discharge exit point. As far as hardness, alkalinity and the pH are concerned, the values are even higher in the EZ than in the RZ.

5.2.7 Preservation of wildlife resources

The construction phase will involve a loss of close to 33 hectares of natural environments, which are primarily composed of land ecosystems. Machinery will create noise and may stress and frighten animals in the BSA.

Despite the significant areas of natural habitats that will be disturbed by the improved transport route (initial clearing and deforestation), hunted and trapped mammals should be able to find replacement habitats in the vicinity of the BSA. As the habitats that will be lost during the construction of the new southern access and the increase in size of the Bachelor complex are all abundant in the region, no single habitat will be destroyed.

According to several studies, some animal species avoid higher-traffic roads more than lower-traffic. Some hunted and trapped species may thus reduce their visits to the BSA after trucking has increased.

Ponds located along the transport route attract migratory geese; truck traffic could therefore disturb them. However, it should be noted that these wildfowl reproduce north of the Project area, the maintenance of their population should not be affected by the traffic.

In fact, the disturbances caused by construction and operation activities, especially those related to trucking, as well as habitat loss, are likely to displace populations of some hunted and trapped animal species to locations further from the BSA. This displacement should not affect the dynamics and health of hunted and trapped mammal populations.

5.3 Potential impacts on the human environment

5.3.1 Continuity of land use

In the context of the IA, the continuity of land use is a multifactorial issue. In this respect, the main vectors adopted to assess the impact of the Project on this issue are as follows:

- Nuisances, noise and dust in particular;
- The safety of users and user perception of safety, which might result in their access to the territory being hampered;
- Forest activities (hunting, trapping, fishing and gathering) which implies the presence of wildlife resources to be caught and could be affected around the transportation road, as well as vegetation that might be affected by dust.

The sources of impact by the Project, significantly interrelated with continued use of the territory, are brush clearance, traffic and supplies linked to improvement of the transportation road and trucking.

Description of the impact is structured on the basis of the types of activities undertaken. For each type, the pertinent potential vectors of the impact are analyzed.

The potential impact vectors regarding hunting and trapping are access, compromised by safety issues, as well as access to wildlife resources.

The transportation road straddles hunting grounds and trails. It is possible that frequent trucking during mining could dissuade users from access to them, due to the inconvenience posed by traffic. In addition, trucking frequency and the related noise could mean that the animals hunted avoid the zone immediately around the transportation road. This avoidance behavior may disturb the hunting activities normally practised along forest roads.

The principal vector of potential impact on fishing activities along the transportation road is hampered access due to safety issues. This concerns several large stretches of water, most of them easily accessible via this road during favourable weather conditions.

The potential impact vectors for gathering are access hindered by safety issues and a decrease in the quality of the plant resource due to dust. However, cross roads providing access to the gathering areas crossed by or adjacent to the transportation road will remain available.

The potential vectors of impact on campsite occupants are access hampered for security reasons and nuisance caused by dust and noise. A permanent camp along the O'Sullivan River is situated not far from the transport route. Another permanent camp is located along the road, some 25 km further east. Nuisance is not expected to have a significant effect on the occupants of other camps in view of their distance from the transportation road.

5.3.2 Socio-economic benefits

At each phase of the Project, labor and the purchase of goods and services constitute the source of impact of the Project with notable interrelations with the socio-economic benefits issue.

Project labor requirements can have a positive impact on two fronts: helping to improve the demographic vitality of LSQ by attracting new workers; and keeping young people in the region who would be interested in working in the mining sector. This observation also applies to other communities in and around the socio-economic study area. Nonetheless, the lack of qualified workers in the region of the Project is a current problem. It should be noted that Metanor's labor force is mostly local (Hamelin, 2019).

It should be noted that the Project could provide employment for the Crees of Waswanipi, especially for an active young population, in addition to contracts. However, given the limited success to date in hiring and retaining workers from Waswanipi and granting contracts to this community, optimization measures will be required to ensure that potential socio-economic benefits do materialize.

Generally, production of 800 tpd (tons per day) at the Bachelor site requires 190 workers. All-in-all, a total of 245 workers hosted at the Bachelor site will be required to produce 2,400 tpd for the Project. The construction phase will create 186 jobs, and the close-down phase will require a similar number. At the Barry site, where there are currently 5 workers, the Project will create 143 additional jobs. The estimated capital cost is in the order of $30 M.

The socio-economic benefits of the Project will be felt both directly and indirectly. Workers and their families will directly benefit from financial stability provided by income from the Project, while local businesses will benefit from obtaining contracts. The Quebec and Canadian Governments will receive tax revenues generated by the Project, while the Cree parties to the Agreement with Metanor will benefit from the terms agreed to in the renegotiated agreement.

The economies of the local and regional communities will benefit indirectly from the Project as a result of the financial stability and increased purchasing power of the workers and entrepreneurs involved in the Project.

5.4 Residual impacts

The Table 5-4 lists the specific mitigation or optimization measures proposed and indicates the extent of residual impacts.

Table 5-4. Summary of the residual impact of the Project

Major issue	Significance of potential impact	Special measures		Significance of residual impact
Climate change	Negative, low	CC1	Include environmental selection clauses/criteria in bid documents for ore trucking	Negative, very low
		CC2	Retread tires of ore transport trucks	
Conservation of air quality at the Bachelor site	Negative, low	AQP1	Busy roadways will be wetted to reduce dust in dry weather	Negative, very low
Protection of Bachelor Lake's water resources	Negative, medium	PWR1	Sampling of Bachelor tailings per each 10-day production cycle, analyzed for AGP and elemental analysis for verification purposes, with a subset of samples analyzed for short-term metal leaching tests. Adaptation of the sampling program under the supervision of a qualified geochemist.	Negative, low
		PWR2	Periodic analysis of Barry tailings (initially one sample per grinding cycle) including APG to confirm the characteristics of ML and AMD and provide a reference state of the overall characteristics of the deposited tailings. Adaptation of the sampling program under the supervision of a qualified geochemist.	
		PWR3	If tailings are observed with a NP/AP < 2: – Conduct the ML/AMD characterization of the ore supplying the processing plant, in addition to performing regular analysis of tailings – Submit representative samples of NP/AP < 2 of Bachelor processing tailings to standard MEND moisture cell testing, in order to determine if a site-specific NP/AP threshold for AGP and non-AGP tailings exists between 1 and 2 for these materials. The management of the ore supply to prevent the production of tailings with NP/AP < 2 would continue, unless a site-specific NP/AP threshold of less than 2 is confirmed by kinetic testing	
		PWR4	If the tailings are observed with an NP/AP between 2 and 3, submit a representative sample of them to the MEND standard moisture cell tests, to confirm their non-AGP character and to provide information on an NP/AP threshold potentially applicable to the site	
		PWR5	Only tailings sufficiently characterized as non-AGP, with a NP/AP > 3 and non-metallic leaching, should be used in dike construction	
		PWR6	Where tailings are used in dike construction, effective runoff and leachate collection measures will be in place to manage short-term releases of metals and cyanides that may occur, even if they have no potential long-term development of AMD	
		PWR7	Complete the classification of Bachelor and Moroy waste rock as building materials	

Major issue	Significance of potential impact	Special measures		Significance of residual impact
		PWR8	Add a monitoring point for supernatant quality at the outlet of the future recirculation basin in order to detect any excess metal levels and make the required adjustments to industrial water treatment	
		PWR9	Regularly ensure that the system for pumping exfiltration water toward the BTSF is functional and in good condition	
Conservation of wetlands and water bodies	Negative, low	CWW1	At the end of the Project, convert the BTSF to a wetland complex	Negative, very low
Preservation of biodiversity	Negative, medium	PBI1	Avoid interventions in natural environments from late April to mid-August	Negative, low
		PBI2	Follow RQO's recommendations for active sandpits (2016)	
		PBI3	Install nesting boxes for chiropterans	
Maintenance of healthy fish populations in Bachelor Lake	Negative, low	MFP1	Expand the contaminant analysis regarding walleye liver	Negative, low
		MFP2	Expand contaminant analysis to walleye liver; Warn local anglers if any contamination in fish tissue or liver is detected, or if there is increased contamination by a substance	
Preservation of wildlife resources	Negative, low	PWR1	Implement a 24-month monitoring program to assess the presence of hunted and trapped animals near the transport route (carcasses, documentation of observations by truck drivers). Plan corrective measures as needed (e.g. road signage).	Negative, low
		PWR2	Install an ultrasonic whistle on each truck to keep animals away from the road and reduce the risk of collisions along the transportation road	
		PWR3	For better visibility, maintain low vegetation by clearing each side of the transportation road across the width of the right-of-way	
		PWR4	Set up an awareness program for truck drivers to develop preventive driving behaviour that minimizes the risk of collisions with wildlife. Adapt this program based on the monitoring data collected using measure PWR1.	
		PWR5	Prohibit workers from hunting or trapping during their shifts	
Continuity of land use	Negative, medium	CLU1	Inform land users of the Project's trucking frequency to allow user movements to be adjusted near the road	Negative, low (if renegotiation of the Agreement with the Crees enables the nuisance issue to be satisfactorily settled)
		CLU2	Decrease or suspend truck traffic during the two weeks of moose hunting in the fall and two weeks of goose hunting in the spring	
		CLU3	Improve signage regarding the speed limit, the presence of camps, ATV traffic, snowmobile crossings, etc.	

Major issue	Significance of potential impact	Special measures	Significance of residual impact
		CLU4 Put in place a road safety plan for the transportation road, including mechanisms for responding to complaints and immediate redress for rule violations CLU5 Share the road safety plan with representative authorities in the communities involved and encourage their feedback on the driving of Project trucks CLU6 Ensure regular training and worker awareness of road safety as well as the activities of land users	
Socio-economic benefits	Positive, high (regional scale) Positive, medium (local scale)	• Maintain the policy of fostering a local labour force by only reimbursing travel expenses for the first 100 kilometres, and by favouring the purchase of goods from, and the granting of contracts to, competitive local companies • Maintain the policy of favouring, at equal value, Cree candidates and businesses when hiring and when granting contracts • Maintain the policy of supporting studies and internships for students interested in working in the mining sector • Continue to offer visits to the Bachelor site to residents of local communities, including Waswanipi students, so they can see first-hand what it means to work in the mining industry • Provide early warning of any reduction or cessation of activities at the Bachelor site to the Discussion Committee, the Harmonization Committee, and leaders representing the concerned communities, so as to prepare them for a possible transition • Make an early start in coordinating with the Discussion Committee, the Harmonization Committee, and leaders representing the concerned communities when planning alternative employment for workers after the closure • Maintain the employee assistance program, which provides advice on sound financial management, among other things, to reduce the negative impact of the Project's closure (e.g., debt) and maximize socio-economic benefits during the construction and operational phases • Maintain a work schedule that is as adapted as possible to local traditional activities, such as goose and moose hunting • Continue to grant extended bereavement leave to Indigenous workers given the importance of bereavement rituals to the social cohesion and spiritual well-being of Indigenous nations • Organize training workshops on diversity in the workplace for the Project workers	Positive, very high (regional scale) Positive, high (local scale)

Major issue	Significance of potential impact	Special measures	Significance of residual impact
		• Promote the grouping of Indigenous workers into teams to form a critical mass of workers so as to encourage their retention • Maintain the hiring of a community liaison officer; • In collaboration with the Discussion Committee, the Harmonization Committee and leaders representing the concerned communities, ensure that there is a mechanism for assessing the Project's benefits at regular intervals and a feedback mechanism for any future problems	

6.0 Analysis of cumulative impacts

This section identifies and assesses the impact that the Project might have on biophysical and human environments when its impact is combined with other projects, activities or events. The latter may be in the past or present or reasonably foreseeable in the near future.

6.1 Determination of the scope of cumulative impacts

To be taken into account in the analysis of cumulative impact, a valued component (VC) of the biophysical or human environment must be linked to the major issues identified in Section 5.1.3. Moreover, analysis only covers VCs liable to be affected by residual impact of low significance or beyond that of the Project itself after implementation of mitigation measures (ACÉE, 2014). Finally, these VCs should be affected by other past, current or reasonably foreseeable projects, activities or events.

On the basis of the above, the VCs adopted for cumulative impact analysis are listed below. Some cover more than one issue, to avoid duplication. Time/space limits were identified for each VC adopted.

Environment	Valued component
Biophysical	Water resource and maintenance of healthy fish populations in Bachelor Lake
	Biodiversity and preservation of wildlife resources
Human	Socio-economic benefits
	Continuity of land use

6.2 Projects and activities selected for analysis of cumulative impacts

Several mining, forestry, tourist/leisure, infrastructure projects or activities identified within the time/space limits defined for each VC were studied (Map 007). The following were adopted for analysis of cumulative impact:

- Windfall Lake and Osborne-Bell mining projects: Future gold mining projects belonging to Osisko Mining. The Windfall Lake project covers two sites: the deposit, situated 60 km southeast of the Bachelor site and the planned processing plant near LSQ. The Osborne-Bell site is also located near LSQ;
- Langlois mine: An underground zinc and copper mine operating all year round, belonging to Nyrstar;
- Coniagas tailings site: The tailings site of the disused Coniagas mine, now closed, belongs to Galaxy Resources, which is responsible for any impact on the environment caused by the tailings site;
- Barry mining project: The Metanor Barry site holds an authorization to mine ore up to 1.2 Mt;
- Gladiator mining project: The Gladiator, belonging to Bonterra, is located near the Barry site. The project is in the exploration phase;
- Wood granules plant: A future plant belonging to Barrette-Chapais, situated near Chapais;
- Pulp and paper plant: A future project owned by Chantiers Chibougamau, situated in LSQ;
- Comtois mill: An ongoing project owned by Produits Forestiers Résolu, located in LSQ. The plant has an annual production capacity of 145 million board feet of timber;

- Solid waste management project at Waswanipi: A future project owned by the CFNW;
- Pourvoirie GRB: Located on the western shore of Bachelor Lake, the outfitter offers seasonal hunting and fishing services, including boat and chalet rental.

6.3 Cumulative impact analysis

The following sections describe the potential impacts of the selected projects and activities that may be added to the residual impacts of the Project based on the VCs involved.

6.3.1 Water resources and maintenance of healthy fish populations in Bachelor Lake

The scale for analysis of the cumulative impact on the aquatic environment has been extended to the Bachelor river drainage basin that feeds Waswanipi Lake. The Coniagas tailings site and GRB outfitters are located within these limits (Map 007).

Pourvoirie GRB is located just downstream of the Bachelor Lake outflow. Its activities do not affect the Project's activities, being of a different nature; moreover, the outfitter's activities are limited to the months of fair weather. Any potential contamination of the aquatic environment by the outfitter would be negligible.

Given the 84.7 km^2 area of the Bachelor Lake watershed, the BTSF drainage area of 1.02 km^2 now accounts for only 1.2% of the water outlet flow from this water body. Once Waswanipi Lake is reached, the influence of the BTSF falls to nearly 0.3%, well below the threshold at which an effect is considered unlikely on fish populations (EC, 2012).

Given that the Project will not affect the water quality and aquatic environment of Waswanipi Lake, it will not contribute to a cumulative impact, notwithstanding any water quality issue that might arise from the Coniagas tailings site, the tailings and leachate from which run into the Bachelor River, which is downstream of Bachelor Lake.

Since it has been assessed that the quality of water flowing out of Bachelor Lake will be compliant in every point with current surface water criteria and that healthy populations are being maintained there, the addition of a source of contaminants in Bachelor River cannot lead to cumulative impact.

6.3.2 Biodiversity and preservation of wildlife resources

No other project or activity has an effect on the biodiversity hotspots studied in the context of the IA. In fact, all of the aspects studied relating to biodiversity are concentrated around the Bachelor site (local BSA), a good distance away from surrounding activity.

The Windfall Lake and Osborne-Bell mining projects, as well as those specific to Bonterra (Barry and Gladiator) cross the zone adopted for study of the preservation of wildlife resources. All these projects are likely to come to fruition over the course of this Project. Any interaction between Pourvoirie GRB and hunted mammals would be negligible.

The Gladiator project will not add to the daily traffic on the transportation road if it comes to fruition during operation of the Project as the proposed Bachelor site ore processing plant production rate will not change in the next few years.

When the Windfall Lake and Osborne-Bell (Osisko) projects move into the operational phase, the ore will be trucked via Road R1053 (also known as Road 5000), which crosses the Barry-Bachelor transportation road. Since the milling rates for the Osisko and Metanor projects are of the same size, a similar trucking rate is anticipated.

As the trucking anticipated for the Osisko projects crosses that of Metanor at right angles, the cumulative impact is negligible on wildlife resources as the right-angled crossing involves an additional hindrance, limited to a small radius. Thus, the possibility of incidents involving trucks remains low; in addition, brush clearance should lead to good visibility at this intersection.

6.3.3 Socio-economic benefits

Several projects that employ or will need to employ a large labor force are currently underway or scheduled in the extended SESA.

Mining is the largest employment sector in LSQ, while the logging industry comes in third place, after the public sector. A lack of qualified labor remains a challenge for municipalities close to the Project.

The Project will make a substantial difference to socio-economic growth of the extended SESA but, at the same time could heighten the labor deficit in the region. Metanor has its own workers camp and the Project will not have a significant impact on the region's accommodation capacity to attract workers from outside.

Metanor proposes to cooperate with the proponents of the projects, municipalities and other pertinent players involved to optimize regional socio-economic benefits and overcome the labor shortage. One means of achieving this would be via a regional-scale consultation group. Moreover, Metanor will prioritize the recruitment of recently-qualified personnel to avoid possible drainage of labor already employed in the municipalities affected by the Project.

6.3.4 Continuity of land use

The source of impact for the *Continuity of use of the land* VC is identical to that for the *Biodiversity and preservation of wildlife resources* VC, which is the traffic generated by transportation of the ore. Medium residual impact had been identified for the *Continuity of use of the land* issue as regards the presence of two permanent camps in the neighborhood of the Barry-Bachelor transportation road. Since these camps are located further north than the transportation crossover effect generated by other projects identified for this issue, the extent of the impact will not increase for these camp locations. This being said, it is assessed that the conclusion is the same for the preservation of wildlife resources, that is to say a negligible cumulative impact on continued use of the land.

7.0 Accident and malfunction risk management

7.1 Background

In the context of a continued risk management process, Metanor has set up an Environmental Emergency Response Plan (EERP) for the Bachelor site, based on accident and malfunction scenarios. The EERP sets out a range of measures for the prevention of accidents and malfunctions at the source, the main ones of which are:

- Identification and assessment of the main risks for receiving environments;
- Development of intervention and control measures to match the severity level of the consequences of an accident or malfunction;
- Worker training on risks and situations that can occur while doing their work;
- Implementation of a risk communication program addressed to the concerned authorities and to the surrounding populations that may be affected.

The EERP is updated and field tested annually to eliminate or reduce risks.

7.2 Identification of the risks of accidents or malfunctions

The main risks of accidents or malfunctions of anthropogenic origin associated with Project activities are as follows:

- Accidental spillage or release of petroleum products;
- Spillage or accidental release of hazardous materials other than petroleum products;
- Spillage of ore during its transport to the Bachelor site;
- Explosions;
- Fires;
- Malfunction of mine tailings and water-retention infrastructure;
- Collisions with wildlife and other users of the Barry-Bachelor transportation road;
- Major accidents occurring in the underground mine.

The following sections summarize the causes and emergency measures for each of these risks. Strict prevention and control measures will be implemented.

7.2.1 Cause

An accidental spill or leak of petroleum, chemical or ore could occur during transportation, handling or storage. Equipment failure, human error or negligence can also be a cause of accidents. The trucking of ore along the Barry-Bachelor transportation road could cause collisions with wildlife and other users of the road if an accident occurred.

A fire can break out in various ways, during the transportation, handling or storage of petroleum and chemicals, as well as in a road collision.

Rock mining at the Bachelor site is done using explosives composed of a mixture of hazardous chemicals. The accumulation of methane generated by blasting activity in the underground mine could also trigger explosions, as this gas is highly flammable. The factors causing an accidental explosion are related to

human error or negligence, as the explosive storage areas have been designed in accordance with current standards.

The Project will raise the dykes to expand the BTSF in order to accommodate the increased milling rate. Tailings spill could occur during a dam failure.

Major accidents occurring in the underground mine are mainly linked to rockfalls, which may result from blasting or dewatering.

7.2.2 Emergency measures

An overview of the main emergency measures is given below.

If petroleum products are accidentally spilled or leaked, this must be immediately reported to the person in charge of the emergency plan who, if necessary, will trigger the emergency plan and warn the people and services required. Once a safety perimeter has been established, efforts must be made to seal or limit the leak if the situation does not present a risk, using the environmental emergency trailer in the warehouse yard or strategically placed recovery kits. Contaminated soil must be collected and confined in the containers provided if there is no risk to worker safety. In the event of a major spill that could endanger the lives of workers, they must proceed to the assembly point identified in the EERP. If the contaminated soil cannot be removed immediately, the area must be covered over with a plastic cover.

The actions taken will be essentially the same as those recommended for a spill of ore or hazardous substances as for those recommended for the spillage of petroleum products. Specific emergency measures apply in the event of the cyanide spillage or leak.

The procedures to be followed in the event of a fire include: immediately warning the person in charge and evacuation of the premises; cutting off the source of the fuel if applicable and extinguishing the fire if possible; triggering the emergency plan as necessary and requesting the assistance of external resources; immediately proceed to the assembly point in the event of evacuation. In the case of a traffic accident with a fire, specific instructions apply.

In the event of an explosion, the person in charge of the emergency plan must initiate the alert procedure and follow the instructions of the emergency team and first responders. In certain cases, the first responder team must assess the risk of explosion and detect signs of BLEVE[1] or blowback. Evacuation to outside the minimum safety perimeter follows. It is also important to stay upwind and use land features and buildings as protective screens, as well as to seek help from external resources.

As far as a malfunction in tailings and water retention infrastructures, the BTSF Operations, Maintenance and Surveillance Manual details the emergency measures and resources required, in line with applicable standards.

In the event of a fire, flood, collapse or other event that may occur in the mine, emergency response procedures are those established by the *Regulation Respecting Occupational Health and Safety in Mines*.

1 BLEVE (Boiling Liquid Expanding Vapor Explosion) can be defined as violent explosive vaporization following the rupture of a tank containing a liquid at a temperature significantly higher than its boiling temperature at atmospheric pressure (Champassith, 2014).

8.0 Monitoring program

The Project Follow-up and Monitoring Plan (FMP) describes the approach and intervention mechanisms to be set up in order to: comply with the law, regulations and directives in force, as well as the requirements of authorizations; ensure appropriate implementation of the mitigation and optimization measures adopted and compliance with corporate commitments to sustainable development.

To ensure efficient application of the measures recommended and compliance with environmental law requirements, Metanor will set up an follow-up and monitoring committee to include the participation of stakeholders, including the CFNW.

Metanor will adopt an adaptive management approach for the implementation of the FMP and will inform and consult stakeholders in doing so.

8.1 Follow-up

Follow-up will involve checks to determine the level of conformity of the Project with the applicable regulatory framework, best practices, Metanor's corporate policies and stakeholder expectations; this will also involve ensuring the implementation of mitigation and optimization measures.

Before work begins, an environmental follow-up team will prepare a set of requirements to be met and measures to be applied; a summary of this document will also be prepared and distributed to the workers assigned to the worksite.

Follow-up will continue for all the main Project activities during the construction, operation and closure of the Project. The inspections made by the follow-up team will be rigorously documented. When breaches or non-compliance is observed, action will be taken to resolve them as soon as possible. Observations, action and results will be recorded in a register.

8.2 Monitoring

Monitoring will be aimed at verifying the accuracy of impact prediction, as well as the efficiency of measures implemented throughout the Project.

This section sums up the monitoring requirements to which Metanor is currently subjected. The description of the current situation is general: other monitoring requirements may be given in detail in the applicable laws, regulations or directives.

Metanor submits an annual monitoring report to the MELCC on current authorization conditions. It will continue to prepare this annual report, which includes all FMP elements of the Project.

When relevant, recommendations for adjustment or rationalization might be formulated for discussion during the course of the Project.

8.2.1 Current situation

8.2.1.1 Biophysical environment

The quality of the final effluent, water and receiving environment sediment is monitored regularly based on specific intervals and parameters. This monitoring is governed by various regulatory obligations, notably the D019, the conditions for the certificates granted, the Depollution Attestation (Attestation) issued by the MELCC (MDDELCC, 2016b) and the MDMER.

In the case of the Project, monitoring of the quality of surface water in the receiving environment relates to the receiving stream and Bachelor Lake. Two samples must be taken for each monitoring exercise, that is to say from the EZ at the final discharge and from the RZ. These zones are also areas where EEM surveys are conducted by virtue of the MDMER. Underground water is monitored by sampling the observation wells around the edge of the BTSF.

Monitoring of intermediate discharge points and sewage water is covered by the Attestation. Inspection observations and required data are kept in a register.

Air quality regulations impose certain limits on discharge into the air. By virtue of the Attestation, several current air emission points include monitoring requirements, with an emphasis placed on particles. Inspection results and any corrective action required must be noted down in a register. The monitoring of emission incudes an annual declaration to the Government of Canada National Pollution Release Inventory for PM_{10}, $PM_{2.5}$ and carbon monoxide releases.

The Attestation does not contain any noise requirements. Nonetheless, Metanor complies with the pertinent articles of the *Occupational Health and Safety Regulations* and the *Occupational Health and Safety Act*.

Several regulations define the requirements for monitoring premises where hazardous residual materials are stored, including final disposal or storage sites for non-hazardous residual substances present on the Project site. The Attestation identifies additional requirements for the BTSF. Data must be transmitted annually and a register kept.

Drinking water is monitored in accordance with the *Guidelines for Drinking Water Quality* .

8.2.1.2 Human environment

In the context of current authorizations, Metanor must "transmit a report setting out training, the contracts granted and jobs occupied by James Bay inhabitants and members of the Waswanipi community to the Administrator, for information. This report must also indicate the efficiency of mitigation measures concerning social and cultural aspects."

8.2.2 Proposed situation

Over and above current monitoring measures, the following measures are proposed for the Project.

8.2.2.1 Biophysical environment

The following elements summarize additional monitoring proposed for the quality of water and discharge:

- Groundwater – one or two observation wells will be lost when the BTSF is expanded. An adequate groundwater monitoring network will be set up, featuring an optimum number of installations.
- Exfiltration water – the exfiltration water capture system at the low points of collection ditches will be monitored. Metanor regularly ensures that the installation for pumping this water to the BTSF is operating and in good condition.
- Intermediate discharge points – in relation to the addition of a water basin in the BTSF, a new intermediate discharge point will be monitored; this concerns the industrial water at the exit of the new recirculation basin before it is discharged to the treatment plant.

The monitoring of ore, waste rock and tailings will include the following activities, which could be adapted under the supervision of a qualified geochemist as results are gradually obtained:

- Two samples of Bachelor tailings to be taken for AGP and elementary analysis per production cycle;
- Periodic analysis of Barry tailings, including the AGP to confirm the ML and AMD characteristics and provide a reference document for the overall characteristics of the tailings deposited;
- Sampling and additional characterization if Bachelor tailings have an NP/AP ratio <2;
- A representative sample of Bachelor tailings to be subjected to standard humidity cell tests if they have an NP/AP ratio between 2 and 3 to confirm the non-acidifying nature;
- Addition of a supernatant quality monitoring point in the future recirculation pond.

Monitoring of the aquatic environment and wildlife resource will include an analysis of fish liver for mercury when EEM surveys are conducted and communication of this type of overrun to Bachelor Lake fishermen as applicable. A 24-month monitoring program will be implemented to assess the presence of hunted and trapped animals near the transport route. An internal register will be kept on application of the last two measures.

8.2.2.2 Human environment

Three parameters will be analyzed for purposes of economic benefits, using measurable indicators, including:

- Hiring of local labor (Indigenous and non-Indigenous);
- Local labor force integration and retention (Indigenous and non-Indigenous);
- Granting of contracts to Indigenous and non-Indigenous companies.

All indicators will be monitored on an annual basis with data kept in a register.

The continuity of land use issue includes three main impact vectors: nuisance, the availability and quality of wildlife and vegetation resources and user safety. Particular care will be devoted to this issue during meetings with stakeholders. Metanor will also implement a system for receiving complaints or comments concerning use of the land. It will keep details of the date, nature and source of complaints or comments, as well as the resulting corporate action.

8.3 Monitoring at the time of site closure or post-closure

Metanor will set up a post-closure monitoring and maintenance program. The new closure plan will be submitted to the MERN and will present the following elements in detail:

- Monitoring and maintenance of all structures;
- Environment monitoring (surface water and groundwater);
- Agronomic monitoring.

The purpose of this monitoring is to confirm the effectiveness of site and vegetation restoration, as well as to verify the performance of corrective measures implemented after closure.

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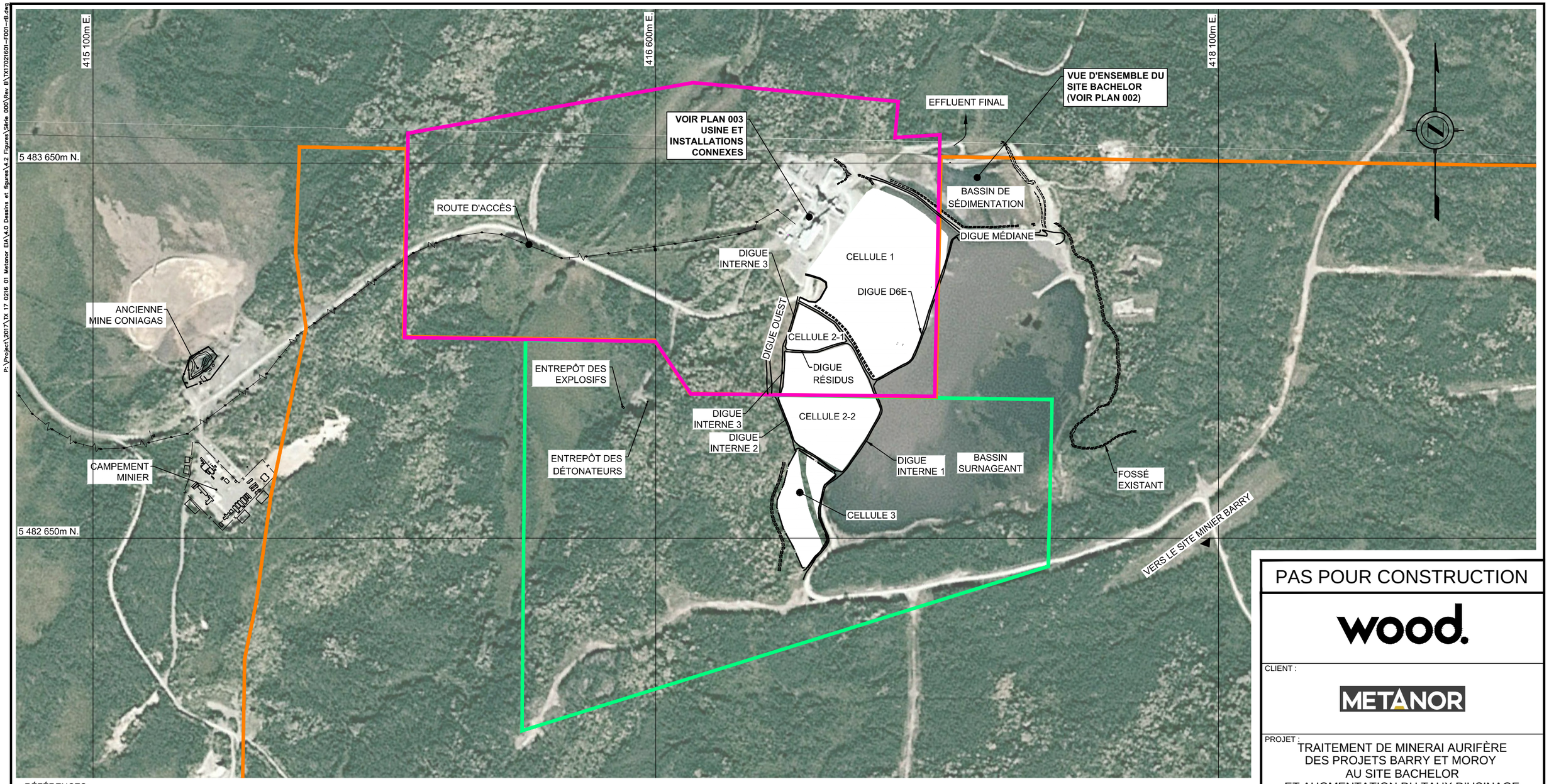
Appendices

Plans and maps

P:\Project\2017\Tx 17 0216 01 Metanor EIA\4.0 Dessins et figures\4.2 Figures\Série 000\Rev B\TX17021601-F001-rB.dwg



VUE EN PLAN
ÉCHELLE 1:10 000

PRÉLIMINAIRE

RÉFÉRENCES:

1. TOUTES LES INFORMATIONS EXISTANTES ET PROPOSÉES PROVIENNENT DU PLAN: ((181105 PLAN FUTUR BACHELOR (ÉTUDE D'IMPACT) 001 SITE MINIER)) DWG., PRÉPARÉ PAR STEVE GAUDREAULT (RESSOURCES MÉTANOR) ET DU RAPPORT (181207_6098002-000000-4G-ERA-0001-R00_BBA) PDF., FOURNIS PAR LE CLIENT.
2. GOOGLE EARTH PRO 2018 (IMAGE SATELLITE 2013).
3. LIMITES DES TITRES MINIERS PROVIENNENT DES PLANS VUE EN PLAN CARTE DES PROPRIÉTÉS, DÉCEMBRE 2015, PDF, ET PLAN DE SURFACE BACHELOR 2018-01-30, DWG, FOURNIS PAR LE CLIENT.
4. COORDONNÉES MTM NAD 83 ZONE 9.

LÉGENDE:

- LIMITE DE PROPRIÉTÉ BACHELOR (BAIL MINIER ET CONCESSION MINIÉRE) (VOIR RÉFÉRENCE 3)
- CLAIMS MINIERS MOROY (VOIR RÉFÉRENCE 3)
- LIMITES DU BAIL MINIER PROPOSÉ DE MOROY (VOIR RÉFÉRENCE 3)
- XXXX — AMÉNAGEMENTS ACTUELS

NOTE:
TOUTES LES INFORMATIONS TRANSPOSÉES SONT APPROXIMATIVES.

ÉCHELLE : 1:10 000

0 200 400 600m

PAS POUR CONSTRUCTION

wood.

CLIENT : METANOR

PROJET :
TRAITEMENT DE MINERAI AURIFÈRE
DES PROJETS BARRY ET MOROY
AU SITE BACHELOR
ET AUGMENTATION DU TAUX D'USINAGE

DESMARAISVILLE, QUÉBEC

TITRE :
PROPRIÉTÉS DU SITE BACHELOR

DATE : (AA-MM-JJ)	ÉCHELLE :	FORMAT
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DESSINÉ PAR :	M. HADDAD, tech.
PROJETÉ PAR :	--
APPROUVÉ PAR :	D. NÉRON, géogr.

PROJET No. :	FIGURE No. :	REV. :
TX17021601	001	B

Mouna.mehfoudhaddad

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RÉFÉRENCES:

1. TOUTES LES INFORMATIONS EXISTANTES ET PROPOSÉES PROVIENNENT DU PLAN: (181105 PLAN FUTUR BACHELOR_ ÉTUDE D'IMPACT, 001 SITE MINIER.DWG), PRÉPARÉ PAR STEVE GAUDREAULT (RESSOURCES MÉTANOR) ET DU RAPPORT (181207_6098002-000000-4G-ERA-0001-R00_BBA.PDF), FOURNIS PAR LE CLIENT.
2. MOSAÏQUE À PARTIR DES PHOTOGRAPHIES AÉRIENNES, Q11025_317_30CM_F09.
3. LA LIMITE PROVIENT DU DESSIN (181211_6098002-4G-D50-0001-BBA BOUNDARY.DWG), FOURNI PAR LE CLIENT.
4. COORDONNÉES UTM NAD 83 ZONE 18.
5. CHEMIN PROPOSÉ PROVIENT DU DESSIN (181211_6098002-BBA BOUNDARY-2018-12-11.PDF), FOURNI PAR LE CLIENT.
6. TOUTES LES INFORMATIONS PROPOSÉES PROVIENNENT DU DESSIN (190109_FOSSÉ COLLECTEUR PROPOSÉ DE BBA.PDF), FOURNI PAR LE CLIENT.

VOIR PLAN 003 USINE ET INSTALLATIONS CONNEXES

417 100m E.

417 600m E.

418 100m E.

5 483 150m N.

5 482 650m N.

LIMITE PROPOSÉE DU PARC À RÉSIDUS

EFFLUENT FINAL

SYSTÈME DE TRAITEMENT DES EAUX INDUSTRIELLES

AXE DE LA DIGUE NORD

FOSSÉ DE DÉRIVATION EAU

GÉOTUBE

BASSIN DE SÉDIMENTATION

SYSTÈME DE TRAITEMENT DES EAUX INDUSTRIELLES

HALDE À STÉRILES

AXE DE LA DIGUE MÉDIANE (REHAUSSEMENT)

DIGUE MÉDIANE

SIPHON

AXE DE LA DIGUE D6e (REHAUSSEMENT)

CANON À EAU

POMPE

BASSIN DE RECIRCULATION

STATION DE POMPAGE

MORT-TERRAIN (PILE DE SOL VÉGÉTAL ET PILE DE SOL MINÉRAL)

ROUTE D'ACCÈS

AXE DE LA DIGUE OUEST

DIGUE OUEST

CELLULE 1

POMPE

CELLULE 2-1

ACCÈS SUD

DIGUE RÉSIDUS

DIGUE INTERNE 3

CELLULE 2-2

DIGUE INTERNE 2

DIGUE INTERNE 1

BASSIN SURNAGEANT

ENTREPÔT DES EXPLOSIFS

ENTREPÔT DES DÉTONATEURS

FOSSÉ

REJET DES RÉSIDUS MINIERS

AXE DE LA DIGUE EMPILEMENT SEC

AXE DE LA DIGUE INTERNE

AXE DE LA DIGUE SUD

CELLULE 3

FOSSÉ

FOSSÉ

POMPE

ARRÊT

NOTE:

TOUTES LES INFORMATIONS TRANSPOSÉES SONT APPROXIMATIVES.

ÉCHELLE: 1:6 000

0 100 200 300 400m

VUE EN PLAN
ÉCHELLE 1:6 000

AMÉNAGEMENTS PROPOSÉS:

- LIMITE PROPOSÉE DU PARC À RÉSIDUS (VOIR RÉFÉRENCE 3)
- INSTALLATIONS ET INFRASTRUCTURES PROPOSÉES (VOIR RÉFÉRENCE 1)
- MORT-TERRAIN (PILE DE SOL VÉGÉTAL ET PILE DE SOL MINÉRAL)
- AXE DE LA DIGUE PROPOSÉ (VOIR RÉFÉRENCE 1)
- FOSSÉ INTERCEPTEUR D'EAU PROPRE (VOIR RÉFÉRENCE 6)
- FOSSÉ DE COLLECTE EAU D'EXFILTRATION OU D'EAU DE RUISSELLEMENT (VOIR RÉFÉRENCE 1)
- ACCÈS SUD PROPOSÉ (VOIR RÉFÉRENCE 5)
- DÉVERSOIR D'OPÉRATION PROPOSÉ (VOIR RÉFÉRENCE 1)
- DÉVERSOIR D'URGENCE ET STRUCTURE DE DÉCANTATION PROPOSÉS (VOIR RÉFÉRENCE 1)
- PANNEAU D'ARRÊT PROPOSÉ (STOP)

AMÉNAGEMENTS ACTUELS:

- DIGUE EXISTANTE
- PUITS D'OBSERVATION RÉALISÉ PAR TECHNOFOR ET D'AUTRES, 2007 À 2012 (VOIR RÉFÉRENCE 1)
- LIGNE DE POMPAGE EXISTANTE
- FOSSÉ EXISTANT
- LIGNE DE REJET DES RÉSIDUS MINIERS
- PUITS D'OBSERVATION NON SUIVI DEPUIS 2017
- FIL ÉLÉCTRIQUE

PAS POUR CONSTRUCTION

wood.

CLIENT :

METANOR

PROJET :

TRAITEMENT DE MINERAI AURIFÈRE
DES PROJETS BARRY ET MOROY
AU SITE BACHELOR
ET AUGMENTATION DU TAUX D'USINAGE

DESMARAISVILLE, QUÉBEC

TITRE :

VUE D'ENSEMBLE DU SITE BACHELOR

DATE : (AA-MM-JJ)	ÉCHELLE :	FORMAT
19-08-14	1:6 000	11x17

DESSINÉ PAR : M. HADDAD, tech.

PROJETÉ PAR : --

APPROUVÉ PAR : D. NÉRON, géogr.

PROJET No. :	FIGURE No. :	REV. :
TX17021601	002	0

Mouna.mahfoudhaddad

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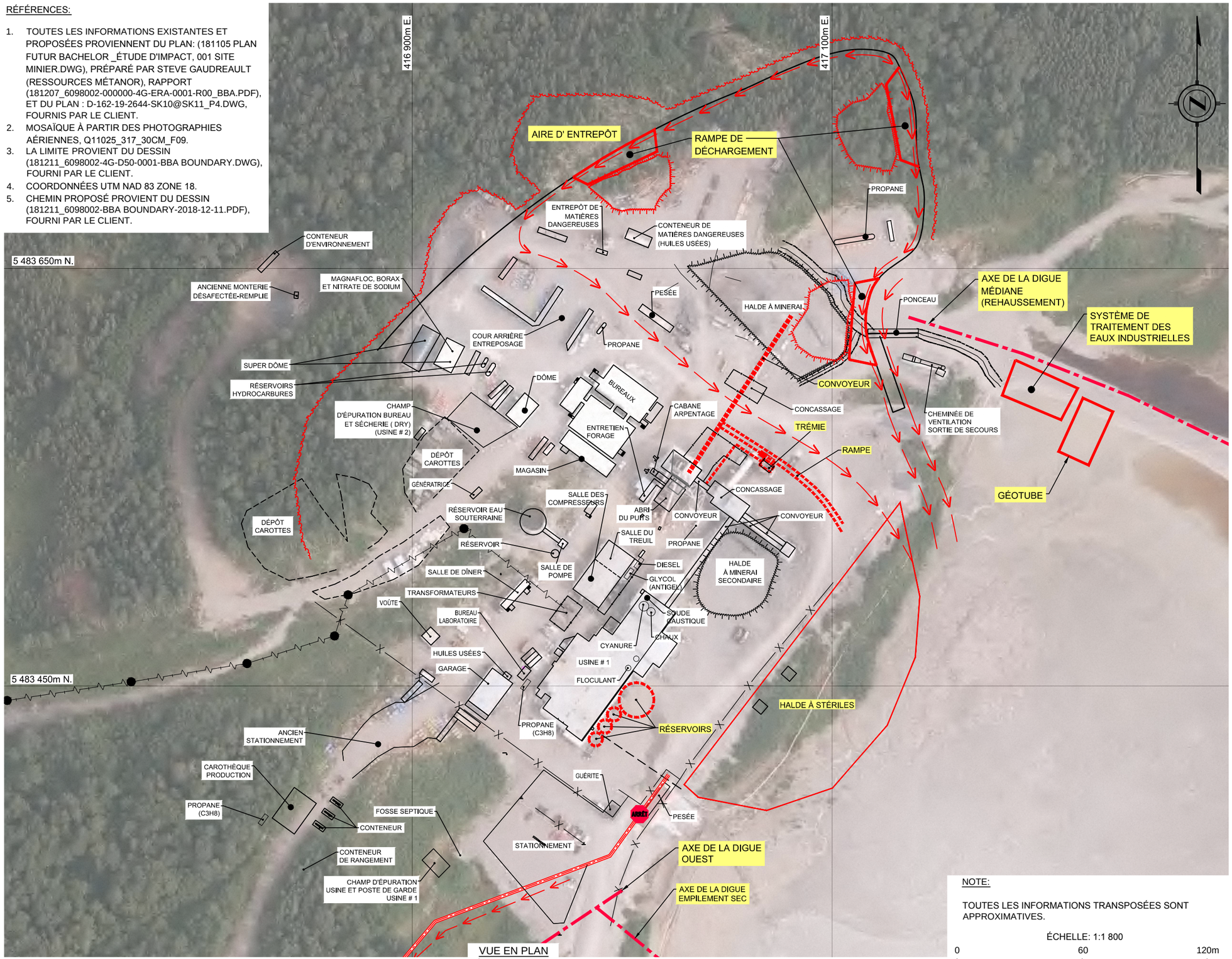
Mouna.mahfoudhaddad

RÉFÉRENCES:

1. TOUTES LES INFORMATIONS EXISTANTES ET PROPOSÉES PROVIENNENT DU PLAN: (181105 PLAN FUTUR BACHELOR _ÉTUDE D'IMPACT, 001 SITE MINIER.DWG), PRÉPARÉ PAR STEVE GAUDREAULT (RESSOURCES MÉTANOR), RAPPORT (181207_6098002-000000-4G-ERA-0001-R00_BBA.PDF), ET DU PLAN : D-162-19-2644-SK10@SK11_P4.DWG, FOURNIS PAR LE CLIENT.
2. MOSAÏQUE À PARTIR DES PHOTOGRAPHIES AÉRIENNES, Q11025_317_30CM_F09.
3. LA LIMITE PROVIENT DU DESSIN (181211_6098002-4G-D50-0001-BBA BOUNDARY.DWG), FOURNI PAR LE CLIENT.
4. COORDONNÉES UTM NAD 83 ZONE 18.
5. CHEMIN PROPOSÉ PROVIENT DU DESSIN (181211_6098002-BBA BOUNDARY-2018-12-11.PDF), FOURNI PAR LE CLIENT.



VUE EN PLAN
ÉCHELLE 1:1 800

AMÉNAGEMENTS PROPOSÉS:

- INSTALLATIONS ET INFRASTRUCTURES PROPOSÉES (VOIR RÉFÉRENCE 1)
- AXE DE LA DIGUE PROPOSÉ (VOIR RÉFÉRENCE 1)
- FOSSÉ DE COLLECTE EAU D'EXFILTRATION OU D'EAU DE RUISSELLEMENT (VOIR RÉFÉRENCE 1)
- ACCÈS SUD PROPOSÉ (VOIR RÉFÉRENCE 5)
- PANNEAU D'ARRÊT PROPOSÉ (STOP)
- HALDE À MINERAI PROPOSÉE (VOIR RÉFÉRENCE 1)
- LIMITE DÉBOISEMENT (VOIR RÉFÉRENCE 1)

AMÉNAGEMENTS ACTUELS:

- CLÔTURE
- FOSSÉ
- CONDUITE USINE ENFOUIE
- HALDE EXISTANTE
- FIL ÉLÉCTRIQUE

NOTE:

TOUTES LES INFORMATIONS TRANSPOSÉES SONT APPROXIMATIVES.

ÉCHELLE: 1:1 800

0 60 120m

PAS POUR CONSTRUCTION

wood.

CLIENT :

METANOR

PROJET :

TRAITEMENT DE MINERAI AURIFÈRE
DES PROJETS BARRY ET MOROY
AU SITE BACHELOR
ET AUGMENTATION DU TAUX D'USINAGE

DESMARAISVILLE, QUÉBEC

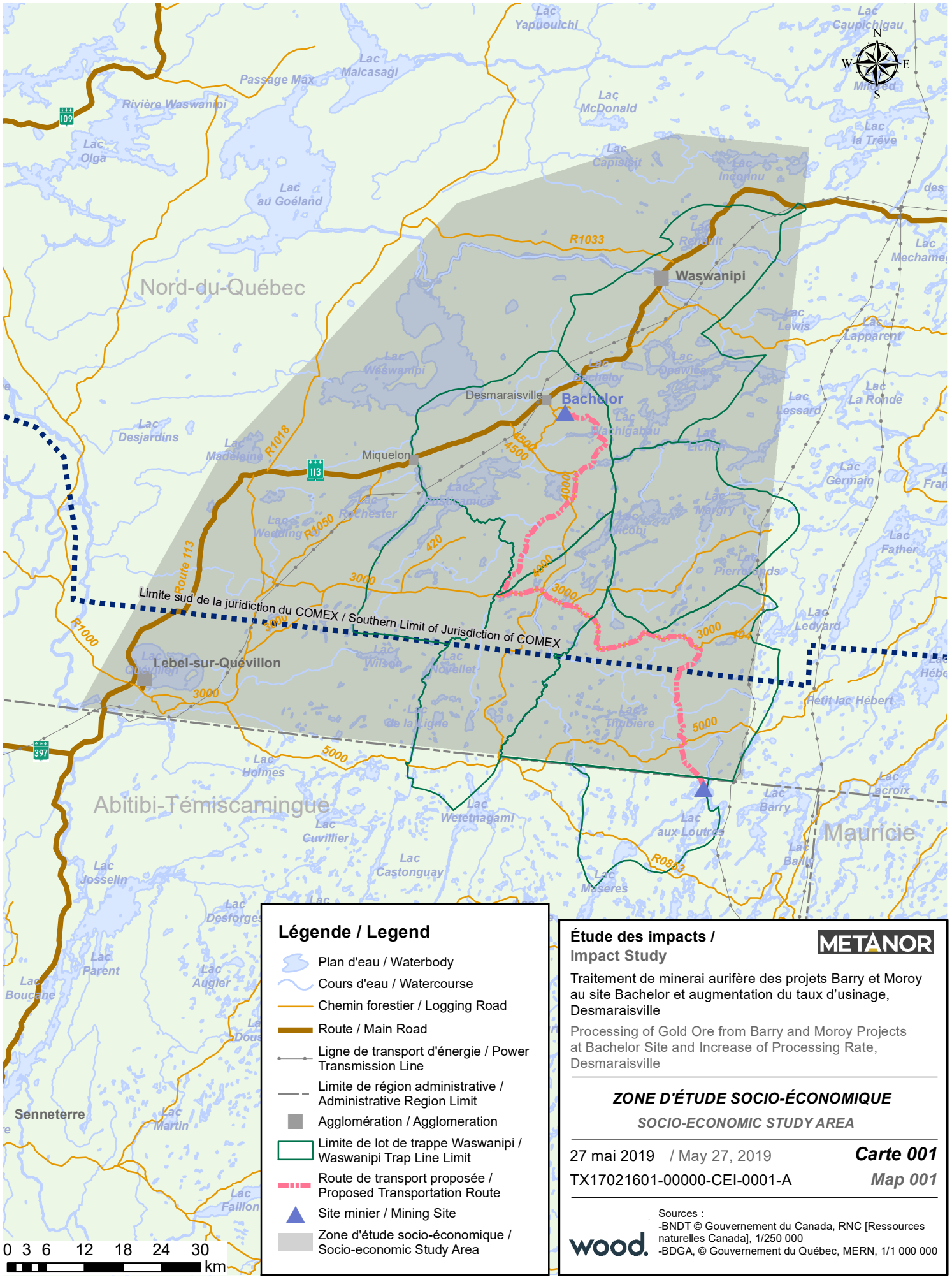
TITRE :

VUE RAPPROCHÉE DES INSTALLATIONS
ET BÂTIMENTS DE L'USINE DE BACHELOR

DATE : (AA-MM-JJ)	ÉCHELLE :	FORMAT
19-08-14	1:1 800	11x17

DESSINÉ PAR :	M. HADDAD, tech.
PROJETÉ PAR :	--
APPROUVÉ PAR :	D. NÉRON, géogr.

PROJET No. :	FIGURE No. :	REV. :
TX17021601	003	0



Légende / Legend

- Plan d'eau / Waterbody
- Cours d'eau / Watercourse
- Chemin forestier / Logging Road
- Route / Main Road
- Ligne de transport d'énergie / Power Transmission Line
- Limite de région administrative / Administrative Region Limit
- Agglomération / Agglomeration
- Limite de lot de trappe Waswanipi / Waswanipi Trap Line Limit
- Route de transport proposée / Proposed Transportation Route
- Site minier / Mining Site
- Zone d'étude socio-économique / Socio-economic Study Area

Étude des impacts /
Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville

Processing of Gold Ore from Barry and Moroy Projects at Bachelor Site and Increase of Processing Rate, Desmaraisville

ZONE D'ÉTUDE SOCIO-ÉCONOMIQUE

SOCIO-ECONOMIC STUDY AREA

27 mai 2019 / May 27, 2019 ***Carte 001***

TX17021601-00000-CEI-0001-A ***Map 001***

wood.

Sources :
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-BDGA, © Gouvernement du Québec, MERN, 1/1 000 000

Étude des impacts /
Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville, Québec

Processing of Gold Ore from Barry and Moroy Projects at Bachelor Site and Increase of Processing Rate, Desmaraisville, Québec

ZONE D'ÉTUDE BIOPHYSIQUE
BIOPHYSICAL STUDY AREA

24 juillet 2019 / July 24, 2019
TX17021601-00000-CEI-0002-A

Carte 002
Map 002

wood.

Sources:
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-CRHQ, © Gouvernement du Québec, MDDELCC-DGEC, 2015, 1/20 000
-Bassins hydrographiques multiéchelles du Québec, © Gouvernement du Québec, MDDELCC
-Infrastructure, Ressources Métanor, 1/2 500

N
W E
S

Lac Bachelor

Site Bachelor / Bachelor Site

Lac Barbie

0 0.25 0.5 1 1.5 2 km

Desmaraisville

Rivière Bachelor

Lac Bachelor

Site Bachelor / Bachelor Site

Ruisseau Auger

Lac Auger

Lac Pusticamica

Ruisseau Malouin

Lac Malouin

Lac Nicobi

Ruisseau Messard

Rivière O'Sullivan

Rivière Muy

Limite sud de la juridiction du COMEX / Southern Limit of Jurisdiction of COMEX

Rivière Fortier

Lac Thubière

Rivière Wetetnagami

Rivière au Panache

Rivière Macho

Vers site Barry / Towards Barry Site

Nord-du-Québec
Abitibi-Témiscamingue

4500
4000
3000
5000

0 1.25 2.5 5 7.5 10 km

Légende / Legend

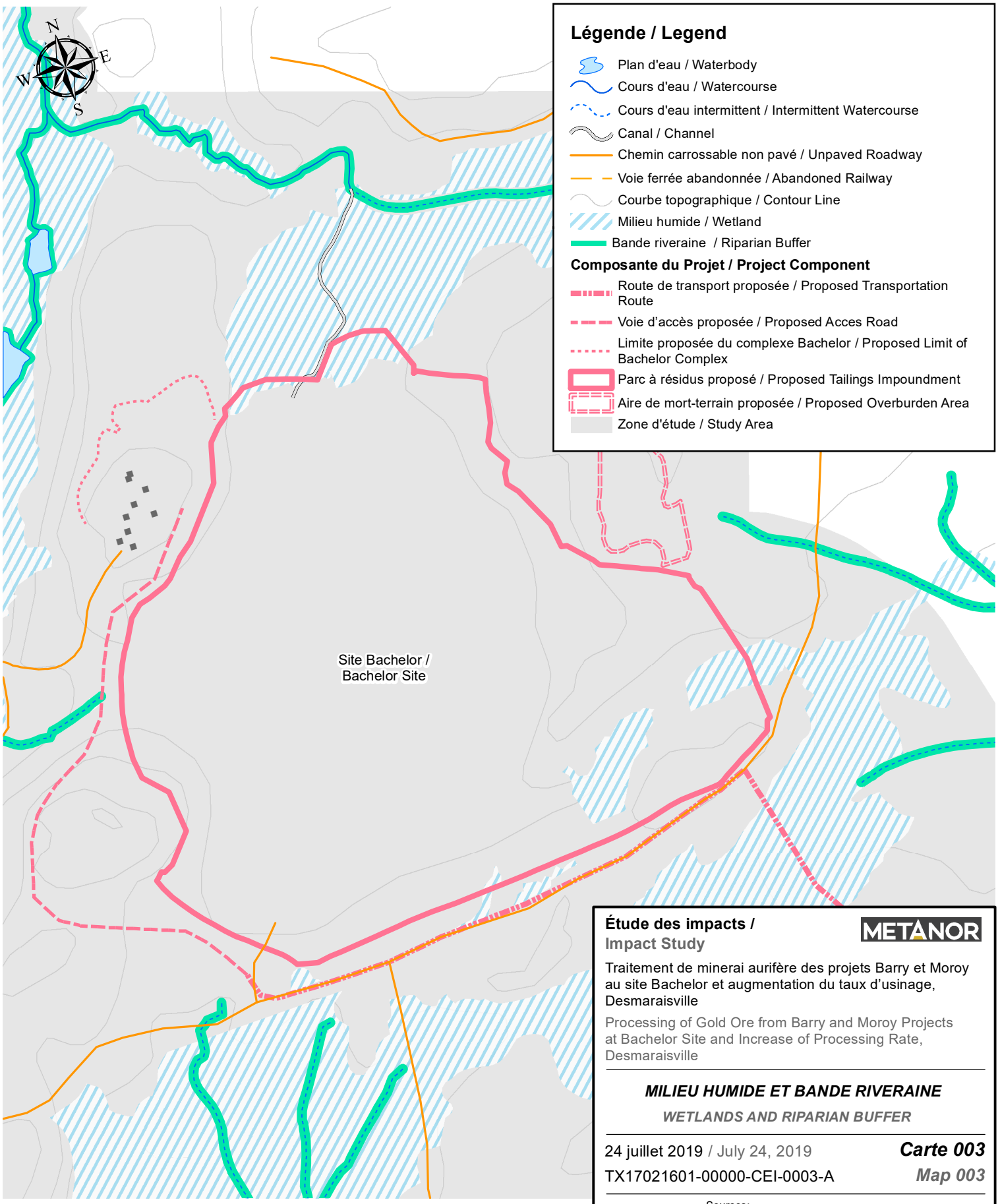
- Plan d'eau / Waterbody
- Cours d'eau / Watercourse
- Cours d'eau intermittent / Intermittent Watercourse
- Canal / Channel
- Route provinciale pavée / Paved Provincial Road
- Chemin carrossable non pavé / Unpaved Roadway
- Voie ferrée abandonnée / Abandoned Railway
- Ligne de transport d'énergie / Power Transmission Line
- Courbe topographique / Contour Line
- Bâtiment / Building
- Aire protégée / Protected Area

Bassin versant / Watershed

- Lac Auger
- Lac Bachelor
- Rivière Bachelor
- Rivière Opawica

Composante du Projet / Project Component

- Banc d'emprunt / Borrow Pit
- Route de transport proposée / Proposed Transportation Route
- Voie d'accès proposée / Proposed Access Road
- Limite proposée du complexe Bachelor / Proposed Limit of Bachelor Complex
- Parc à résidus proposé / Proposed Tailings Impoundment
- Aire de mort-terrain proposée / Proposed Overburden Area
- Zone d'étude / Study Area



Étude des impacts /
Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville

Processing of Gold Ore from Barry and Moroy Projects at Bachelor Site and Increase of Processing Rate, Desmaraisville

MILIEU HUMIDE ET BANDE RIVERAINE

WETLANDS AND RIPARIAN BUFFER

24 juillet 2019 / July 24, 2019

Carte 003

TX17021601-00000-CEI-0003-A

Map 003

wood.

Sources:
-BNDT © Gouvernement du Canada, RNC [Ressources naturelles Canada], 1:250 000.
-BDTQ © Gouvernement du Québec, MERN, 1 : 20 000
-CRHQ, © Gouvernement du Québec, MDDELCC-DGEC, 2015, 1/20 000
-Relevé du milieu aquatique Enviréo-Conseil, 2011, 2015, 2016
-Infrastructure, Ressources Métanor, 1/2 500

Étude des impacts /
Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville, Québec

Processing of Gold Ore from Barry and Moroy Projects at Bachelor Site and Increase of Processing Rate, Desmaraisville, Québec

MILIEU AQUATIQUE
AQUATIC ENVIRONMENT

24 juillet 2019 / July 24, 2019
TX17021601-00000-CEI-0004-A

Carte 004
Map 004

wood.

Sources:
-BNDT © Gouvernement du Canada, RNC [Ressources naturelles Canada], 1:250 000.
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-CRHQ, © Gouvernement du Québec, MDDELCC-DGEC, 2015, 1/20 000
-Relevé du milieu aquatique Enviréo-Conseil, 2011, 2015, 2016
-Infrastructure, Ressources Métanor, 1/2 500

N
W E
S

Lac Bachelor

ZR3
ZR1 baie
ZRPUP
ZR1
ZEEP
ZEPUP
ZE baie
ZEEB
ZE
ZER
ZR2
Ruisseau ZE
Amont NE
Ruisseau ZR2
Ruisseau Récepteur
Effluent
Amont Est
Amont Sud-Ouest
Site Bachelor / Bachelor Site
113

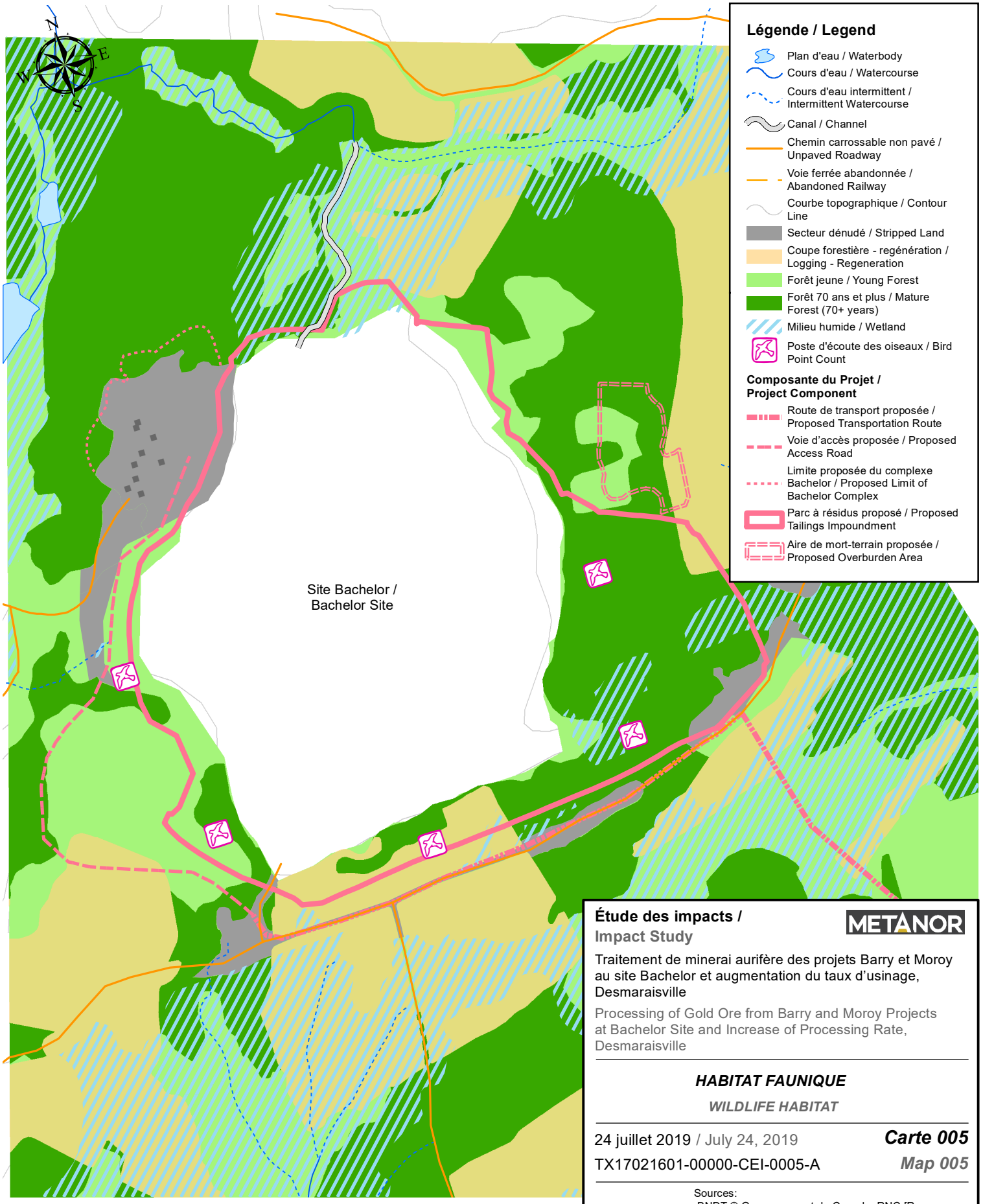
0 0.15 0.3 0.6 0.9 1.2 km

Légende / Legend

- Plan d'eau / Waterbody
- Cours d'eau / Watercourse
- Cours d'eau intermittent / Intermittent Watercourse
- Canal / Channel
- Écoulement / Flow
- Route provinciale pavée / Paved Provincial Road
- Chemin carrossable non pavé / Unpaved Roadway
- Voie ferrée abandonnée / Abandoned Railway
- Courbe topographique / Contour Line
- Ligne de transport d'énergie / Power Transmission Line
- Bâtiment / Building

Composante du Projet / Project Component

- Voie d'accès proposée / Proposed Access Road
- Route de transport proposée / Proposed Transportation Route
- Limite proposée du complexe Bachelor / Proposed Limit of Bachelor Complex
- Parc à résidus proposé / Proposed Tailings Impoundment
- Aire de mort-terrain proposée / Proposed Overburden Area
- Zone d'étude / Study Area
- Effluent final / Final Effluent
- Aire de pêche expérimentale / Experimental Fishing Area 2016-2018
- Zone de suivi pour l'ESEE (référence) / Monitoring Area for EEM (reference)
- Zone de suivi pour l'ESEE (exposée) / Monitoring Area for EEM (exposed)
- Échantillonnage du milieu récepteur / Sampling of Receiving Environment
- Échantillonnage des sédiments / Sampling of Sediments



Légende / Legend

- Plan d'eau / Waterbody
- Cours d'eau / Watercourse
- Cours d'eau intermittent / Intermittent Watercourse
- Canal / Channel
- Chemin carrossable non pavé / Unpaved Roadway
- Voie ferrée abandonnée / Abandoned Railway
- Courbe topographique / Contour Line
- Secteur dénudé / Stripped Land
- Coupe forestière - regénération / Logging - Regeneration
- Forêt jeune / Young Forest
- Forêt 70 ans et plus / Mature Forest (70+ years)
- Milieu humide / Wetland
- Poste d'écoute des oiseaux / Bird Point Count

Composante du Projet / Project Component

- Route de transport proposée / Proposed Transportation Route
- Voie d'accès proposée / Proposed Access Road
- Limite proposée du complexe Bachelor / Proposed Limit of Bachelor Complex
- Parc à résidus proposé / Proposed Tailings Impoundment
- Aire de mort-terrain proposée / Proposed Overburden Area

0 0.15 0.3 0.45 0.6 Km

Étude des impacts / Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville

Processing of Gold Ore from Barry and Moroy Projects at Bachelor Site and Increase of Processing Rate, Desmaraisville

HABITAT FAUNIQUE

WILDLIFE HABITAT

24 juillet 2019 / July 24, 2019

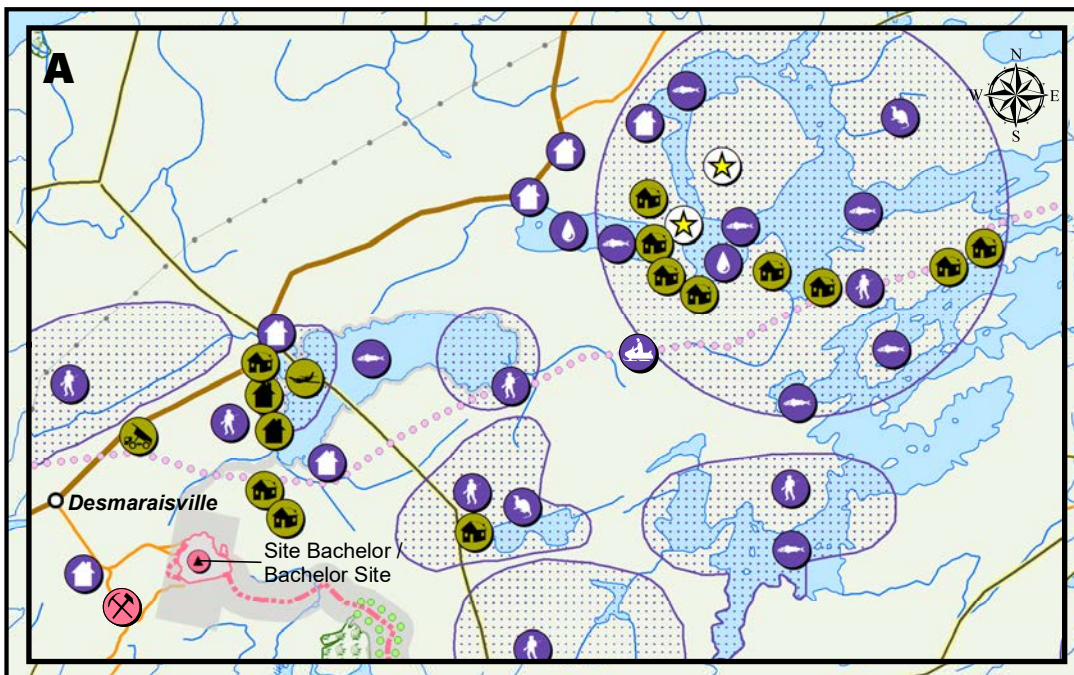
Carte 005

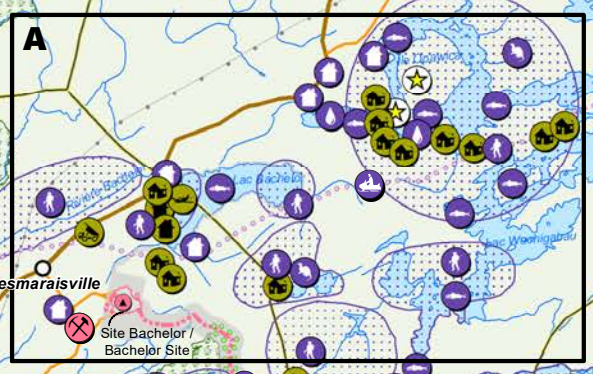
TX17021601-00000-CEI-0005-A

Map 005

wood.

Sources:
-BNDT © Gouvernement du Canada, RNC [Ressources naturelles Canada], 1:250 000.
-BDTQ © Gouvernement du Québec, MERN, 1 : 20 000
-CRHQ, © Gouvernement du Québec, MDDELCC-DGEC, 2015, 1/20 000
-Relevé du milieu aquatique Enviréo-Conseil, 2011, 2015, 2016
-Infrastructure, Ressources Métanor, 1/2 500





LÉGENDE / LEGEND

Composante du milieu humain / Human Environment Component

- Campement permanent cri / Cree Permanent Camp
- Campement saisonnier cri / Cree Seasonal Camp
- Lieu d'approvisionnement en eau potable / Drinking Water Supply
- Circuit de chasse / Hunting Circuit
- Parcours de navigation / Navigation Route
- Sentier de motoneige / Skidoo Trail
- Aire de pêche / Fishing Area
- Aire de chasse / Hunting Area
- Aire de trappe / Trap Area
- Secteur de cueillette de petits fruits / Berry Picking Area
- Site de sépulture / Burial Site
- Site ou secteur valorisé / Valued Site or Sector
- Lot de trappe de Waswanipi / Waswanipi Trap Line
- Sentier de chasse valorisé / Valued Hunting Trail
- Campement non cri / Non-Cree Camp
- Villégiature / Cottage, Camping
- Hydrobase / Seaplane Base
- Site d'enfouissement / Landfill Site
- Secteur de camps non autochtones / Non-Aboriginal Camps Sector

Composante du Projet / Project Component

- Site minier / Mining Site
- Banc d'emprunt / Borrow Pit
- Route de transport proposée / Proposed Transportation Route
- Parc à résidus proposé / Proposed Tailings Impoundment
- Zone d'étude / Study Area

Milieu naturel / Natural Environment

- Cours d'eau / Watercourse
- Plan d'eau / Waterbody
- Refuge biologique / Biological Refuge

Réseau de transport et d'énergie électrique / Transportation and Electricity Network

- Route provinciale pavée / Provincial Road
- Chemin carrossable non pavé / Unpaved Roadway
- Ligne de transport d'énergie / Power Transmission Line

Limite administrative / Administrative Boundary

- Hameau / Hamlet
- Limite de la région administrative / Limit of the Administrative Region
- Limite sud de la juridiction du COMEX / Southern Limit of Jurisdiction of COMEX

Limite sud de la juridiction du COMEX / Southern Limit of Jurisdiction of COMEX

Desmaraisville
Miquelon
Waswanipi
Site Bachelor / Bachelor Site
Site Barry / Barry Site
Nord-du-Québec
Abitibi-Témiscamingue
W15
W19
W20
W21
W21A
W21B
W21C
W24
W24A
W24B
W24C
W24D
W25
W25A
W25B
16
17
18
19
113

Étude des impacts /
Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville, Québec

Processing of Gold Ore from the Barry and Moroy Projects at the Bachelor Plant and Increase of the Processing Rate Desmaraisville, Quebec

INVENTAIRE DU MILIEU HUMAIN
HUMAN ENVIRONMENT SURVEY

27 mai 2019 / May 27, 2019 — ***Carte 006*** / ***Map 006***

TX17021601-00000-CEI-0006-A

Sources :
- BNDT ©Gouvernement du Canada, RNCan, 2017, 1:250 000.
- BNTQ, ©Gouvernement du Québec, MERN, 2017, 1:20 000.
- CANVEC, ©Gouvernement du Canada, RNCan, 2017, 1:1 000 000.
- CRHQ, 1:20 000, ©Gouvernement du Québec, MDDELCC-DGEC, 2015.
- Utilisation du territoire par la communauté crie,©Wood, 2018, 1:10 000.

wood.

0 3,5 7 10,5 km

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Étude des impacts /
Impact Study

METANOR

Traitement de minerai aurifère des projets Barry et Moroy au site Bachelor et augmentation du taux d'usinage, Desmaraisville, Québec

Processing of Gold Ore from Barry and Moroy Projects at Bachelor Site and Increase of Processing Rate, Desmaraisville, Québec

IMPACTS CUMULATIFS

CUMULATIVE IMPACTS

6 juin 2019 / June 6, 2019
TX17021601-00000-CEI-0007-A

Carte 007
Map 007

wood.

Sources:
-BNDT © Gouvernement du Canada, RNC Ressources naturelles Canada], 1:250 000
-BDGA, © Gouvernement du Québec, MERN, 1:1 000 000

N
W E
S

Nord-du-Québec

Abitibi-Témiscamingue

Mauricie

Mishtuk
SMEDD*
Waswanipi
Ch. forestier E ouest
Lac Shortt
Camping Waswanipi
GRB
Desmaraisville
Bachelor
Coniagas
Miquelon
Portage
Langlois
Osborne-Bell
Comtois
Lebel-sur-Quévillon
Pâte et papier
Lac Windfall – usine
Wetetnagami
Club Kapitachuan
St-Cyr Royal
Barry
Gladiator
Lac Windfall
Two Lions
Lac Hébert
Limite sud de la juridiction du COMEX / Southern Limit of Jurisdiction of COMEX
Oujé-Bougoumou
Chapais
Granules
Landrienne

R1033 R1018 R1050 R0853 Route 113 113

0 3 6 12 18 24 30 km

*Site municipal d'enfouissement de déchets domestiques / Municipal domestic waste landfill site

Légende / Legend

- Plan d'eau / Waterbody
- Cours d'eau / Watercourse
- Chemin forestier / Logging Road
- Route / Main Road
- Voie ferrée / Railway
- Ligne de transport d'énergie / Power Transmission Line
- Limite de région administrative / Administrative Region Limit
- Agglomération / Agglomeration
- Limite spatiale pour CV Ressource faunique et Utilisation du territoire / Spatial Limit for VC Wildlife Resource and Land Use
- Limite spatiale pour CV Retombées socio-économiques / Spatial Limit for VC Socio-economic Benefits
- Limite spatiale pour CV Milieu aquatique / Spatial Limit for VC Aquatic Environment
- Route de transport proposée / Proposed Transportation Route

Projets et activités / Projects and Activities

- Site minier fermé / Closed Mine Site
- Site minier en exploitation / Operating Mine Site
- Site minier projeté / Projected Mine Site
- Projet forestier fermé / Closed Forestry Project
- Projet forestier en exploitation / Operating Forestry Project
- Usine forestière projetée / Projected Forestry Plant
- Pourvoirie ou camping en exploitation / Operating Outfitter or Camping
- Infrastructure projetée / Projected Infrastructure

Report limitations

Report limitations

1. Work undertaken in the context of preparation of this report and the conclusions drawn in it are subject to the following limitations:

   a) the agreement between Wood and the customer, including subsequent written modifications or requests for change, duly signed by the parties;

   b) the limitations mentioned in this document.

2. The information and conclusions contained in this report are solely based on: i) the information available at the time of preparation; ii) the accuracy and exhaustive nature of the data provided by the customer or a third party, iii) the assumptions, qualifications or limitations listed in this report.

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   The environmental conditions on the site were assessed within the limits set out above, taking into account environmental regulations in force at the time of the work.