



GALAXY LITHIUM (CANADA) INC.

# **JAMES BAY LITHIUM MINE**

## **SUMMARY OF PROJECT DESCRIPTION**

OCTOBER 2017







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**GALAXY LITHIUM (CANADA) INC.**

REPORT (FINAL VERSION)

PROJECT NO.: 171-02562-00  
DATE: OCTOBER 2017

PRESENTED TO:

CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY

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Study Manager      Richard Kelso-Marsh, B.E. MIE Aust

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# 1 INTRODUCTION

The preparation of this project description is the first step in the environmental impact assessment process by which the proponent, Galaxy Lithium (Canada) Inc. (Galaxy), informs Quebec's Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) and the Canadian Environmental Assessment Agency (CEAA) in writing of its intention to undertake a project. The project description allows the various ministries involved to determine the type of environmental study to be conducted and to issue a formal notice indicating the nature, area and scope of the study that the project proponent is expected to produce.

The project notice outlines the general characteristics of the project. They are presented in a clear and concise manner and include the components that are relevant in understanding the project and its anticipated impacts. It is our understanding that once MDDELCC and CEAA receive the project description, it is then forwarded to all the ministries that are likely to have a direct interest in or be concerned by the project. The project description is submitted to MDDELCC's Deputy Minister and to CEAA by WSP Canada inc. (WSP) on behalf of Galaxy.

The James Bay Lithium Mine Project is located in the Nord-du-Québec administrative region of Quebec. Galaxy is looking to open and operate an open-pit lithium mine that would be located along the James Bay Road near the Km381 Truck Stop.

Apart from its pit, the mining facility will include an ore concentrator, tailings/waste rock/ore/overburden storage areas as well as accompanying infrastructure. The concentrated ore will be trucked to a transfer site in Matagami which is owned and operated by the municipality. The concentrate will be placed on trains to be transported south, where it will be directed onward to lithium conversion facilities to be processed into lithium chemicals.

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## 1.1 PROJECT PROPONENT

Galaxy is a wholly owned subsidiary of Galaxy Resources Limited (Galaxy Resources), a company listed on the Australian Stock Exchange (ASX). Galaxy Resources is one of the premier global lithium companies with existing production and a world-class asset and development pipeline. By way of subsidiaries, it currently operates the Mt. Cattlin Spodumene Mine in Australia and is developing the Sal de Vida Brine Project in Argentina (in an area known as the "lithium triangle"). Thus, Galaxy, is the Galaxy Resources subsidiary acting as the proponent of the James Bay Lithium Mine Project.

The contact information of the project proponent is as follows:

### **Head Office**

140 Grande-Allée Est, Suite 800  
Québec (QC) G1R 5M8

### **Project Office**

2000, rue Peel, Suite 720  
Montréal (QC) H3A 2W5

Website: [www.galaxylithium.com](http://www.galaxylithium.com)

Québec enterprise number (NEQ): 1167071928

Richard Kelso-Marsh

Study Manager and Official Representative

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Email: [richard.kelso-marsh@galaxylithium.com](mailto:richard.kelso-marsh@galaxylithium.com)

Galaxy has retained the services of WSP to prepare the project description for the James Bay Lithium Mine Project. The project direction is assured by Andréanne Boisvert and Ghyslain Pothier.

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## 1.2 PROJECT TITLE

The following is the official project title: James Bay Lithium Mine.

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## 1.3 ENVIRONMENTAL ASSESSMENT PROCESS

The James Bay Lithium Mine project being on lands that are south of the 55<sup>th</sup> parallel but within the territory covered by the James Bay and Northern Quebec Agreement (JBNQA), it requires environmental approvals at both the federal and provincial levels. The project triggers the provincial environmental impact assessment and review process of the *Environment Quality Act* (EQA) (s.153 of Chapter II). Chapter II presents the provisions that apply to the Nord-du-Québec region. Schedule A of the act lists all applicable projects that bring about the assessment and review process such as any mining project, including expansion, transformation or modification of an existing mining operation.

The project triggers the provincial environmental impact assessment and review process applicable to the James Bay and Northern Québec region provided under Chapter II of the *Environment Quality Act* (CQLR, c. Q-2) (EQA). Schedule A of the EQA, as referred to in s. 153, provides a list of projects automatically subject to the assessment and review procedure contemplated under Chapter II of the EQA such as any mining project.

It also requires a federal environmental assessment under the *Canadian Environmental Assessment Act, 2012* (SC 2012, c. 19, s 52) (CEEA 2012) in application of the *Regulations Designating Physical Activities* (DORS/2012-147), as the mine will extract more than 3,000 t/day (s.16a) and the ore concentrator will have an input capacity higher than 4,000 t/day (s.16b).

In conjunction to these laws, the James Bay Lithium Mine is subject to Chapter 22 of the JBNQA which defines the applicable environmental and social protection regime in relation to development activities. Appendix 1 to this said chapter also contains a list of projects that are subject to the environmental assessment procedure, including mine openings. As such, the environmental assessment process will be guided by the provisions of this chapter and environmental evaluation committees will be created (COMEX and COMEV). These committees will ensure that the Cree people are represented and involved in the process.

Since the site design is still under development, a list of permits likely to be needed to operate the project's site has yet to be finalised. However, the following federal laws (and, as applicable, regulations adopted thereunder) may be applicable to the project:

- *Canadian Environmental Assessment Act*;
- *Canadian Environmental Protection Act*;
- *Migratory Birds Convention Act*;
- *Species at Risk Act*;
- *Fisheries Act*;
- *Explosives Act*;
- *Hazardous Products Act*;
- *Transportation of Dangerous Goods Act*.

In addition, it is anticipated that the following permits will be required at the federal level:

- An authorization to store and manipulate chemicals (*Environmental Emergency Regulations*);
- A permit for transportation of chemicals (*Transportation of Dangerous Goods Act*);
- An authorization to cause serious harm to fish (*Fisheries Act*);
- An authorization for mine effluent(s) (*Metal Mining Effluent Regulations*);
- A permit to possess, store and use explosives (*Explosives Act*).

At the provincial level, the following laws (and, as applicable, regulations adopted thereunder) may apply to the project:

- *Mining Act;*
- *Environmental Quality Act;*
- *An Act respecting occupational health and safety;*
- *Sustainable Forest Development Act;*
- *An Act respecting the Lands in the domain of the State;*
- *Petroleum Products Act;*
- *An Act respecting threatened or vulnerable species;*
- *An Act respecting the conservation of wetlands and bodies of water;*
- *An Act respecting the conservation and development of wildlife;*
- *Building Act;*
- *An Act respecting explosives.*

The project site is not located on federal lands and no federal proponent is involved in the project. Furthermore, no federal financing will support the carrying out of the project. In the context of the project description, a meeting was organized by WSP and Galaxy with the Band Council of the Eastmain Cree community and a tallyman from this community likely to be impacted. The meeting was held on May 23<sup>rd</sup>, 2017 in Eastmain. Initial contacts had been established in 2011 by Galaxy with this same community. No regional studies have been undertaken in the sector where the project is located.



## 2 PROJECT INFORMATION

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### 2.1 PROJECT JUSTIFICATION

Lithium is the lightest metal in the periodic table. Its symbol is Li and its atomic number is 3. It is a soft, silver-white metal belonging to the alkali metal group. Under standard conditions, it is the least dense solid element. Like all alkali metals, lithium is highly reactive and flammable. The combination of lightness and high reactivity make it uniquely suited for use in batteries and many industrial processes. Lithium never occurs freely in nature, only in compounds. Lithium is found in a number of pegmatite minerals, the most important of which is spodumene. Moreover, due to its solubility as an ion, it is present in ocean water and can also be found in continental brines and clays.

There is a diverse range of applications for lithium, which include glass, ceramics, grease, air treatment, polymers, pharmaceuticals and importantly battery materials for lithium ion batteries. The glass and ceramics segment had the largest share of industrial applications, however in recent years with the adoption of the lithium battery as the main energy storage platform for consumer and portable electronics, as well as the rapid growth of other segments such as electric and hybrid vehicles, as well as distributed storage in home and commercial applications, the battery segment has grown to become the largest end user segment for lithium. In 2016, an estimated 190 kt of lithium carbonate equivalent (LCE) was produced globally and approximately 44% of that LCE was being used in battery applications. With the expected continued growth in adoption of new energy vehicles (electric and hybrid) globally, as well as increased deployment of lithium battery-based mass energy storage systems, the demand for lithium is expected to experience strong growth in the coming years. Based on the current growth projections across all applications, demand for lithium is expected to increase to approximately 870 kt of LCE by 2025 (Galaxy Resources, 2017).

Therefore, the rationale behind this proposed mining project lies on the increasing lithium demand in the global market. The following elements support the development of the James Bay Lithium Mine Project:

- Increasing global demand for lithium raw materials;
- Promising market projections for lithium chemicals for use in the battery materials sector, including lithium carbonate and lithium hydroxide;
- Significant economic benefits for Québec, especially in the Nord-du-Québec administrative region.

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### 2.2 PROJECT LOCATION

The James Bay Lithium Mine Project is located in the Nord-du-Québec administrative region. The property is located approximately 10 km south of the Eastmain River, 100 km east of James Bay and the Eastmain Cree village (Map 1). The property is on Category III lands of the James Bay and Northern Quebec Agreement (JBNQA).

The development will include mining operations and a spodumene<sup>1</sup> concentrator, associated mining infrastructure together with local infrastructure improvements to support mining operations. The geographical coordinates in UTM (zone 18, NAD83) of the site are presented below.

- X: 358,891
- Y: 5,789,180

The lands subject to the mining claims of the James Bay Lithium Mine Project (Project Property) is easily accessed by the James Bay Road that connects Matagami and Radisson. This road crosses the James Bay Property at kilometre 381 of the

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<sup>1</sup> The theoretical lithium content in spodumene ( $\text{LiAlSi}_2\text{O}_6$ ), expressed in the form of oxide ( $\text{Li}_2\text{O}$ ), is 8.03%  $\text{Li}_2\text{O}$ . Pure lithium carbonate is 40.44%  $\text{Li}_2\text{O}$ .

road, close to the Km 381 Truck Stop, and the road at that kilometre is managed by the James Bay Development Corporation (SDBJ). On the mining property, a road network will be developed to access the open pit and the spodumene ore concentrator.

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## 2.3 PROJECT DEVELOPMENT

The Project Property was first staked in 1966 by Mr. J. Cyr after his discovery of spodumene pegmatite outcrops on the property in 1964. The Project Property was optioned by him to the SDBJ in 1974, which after conducting additional exploration thereon returned the Project Property to Mr. Cyr on June 10, 1986.

In April 2008, Lithium One Inc. signed a letter of intent with the SDBJ to explore and develop a group of claims encompassing the historic "CYR Lithium-bearing Pegmatite Deposit". Lithium One Inc. drilling programs in both 2008 and 2009 confirmed the presence of wide pegmatite intersections, numerous swarms over several hundred meters and a kilometer long strike to a depth of 150 m. The conclusion from this drilling program was that a significant pegmatite resource could be found on this part of the Project Property.

In 2010, Galaxy Resources signed a memorandum of understanding (MOU) with Lithium One Inc. (TSX-V: LI) that contemplated Galaxy Resources could acquire from Lithium One Inc. up to 70% of the James Bay Lithium Mine project and the formation of a joint venture for its development. In accordance with the MOU, a farm-in and joint venture agreement was signed in 2011 between Galaxy (a wholly owned subsidiary of Galaxy Resources), to which Galaxy Resources had assigned its rights under the MOU, and Lithium One Inc. with respect to the option and joint venture set forth above and further to which Galaxy immediately acquired a 20% undivided interest in the James Bay Lithium Mine project.

In April 2012, Galaxy Resources announced that it intended to take over Lithium One Inc. by way of a Scheme of Arrangement transaction to acquire all issued and outstanding common shares of Lithium One Inc., the end result being that once such transaction would be completed, the rights and interests of Lithium One Inc. in and to the James Bay Lithium Mine Project as well as its Sal de Vida Lithium Potash Brine Project in Argentina would be under the sole control of Galaxy Resources, by way of wholly owned subsidiaries. The transaction was then approved and completed in July of that year - thereafter, Lithium One then became a wholly owned subsidiary of Galaxy Resources and was subsequently delisted from the TSX.

In 2011, Galaxy issued a project notice for the James Bay Lithium Mine Project. However, in 2012 the project was suspended due to the decrease in the price of lithium, with the project no longer being viable based on the economics in the market at that time. This project description will replace the 2011 project notice and will allow for the environmental assessment process for the revised project as outlined in this document to begin.

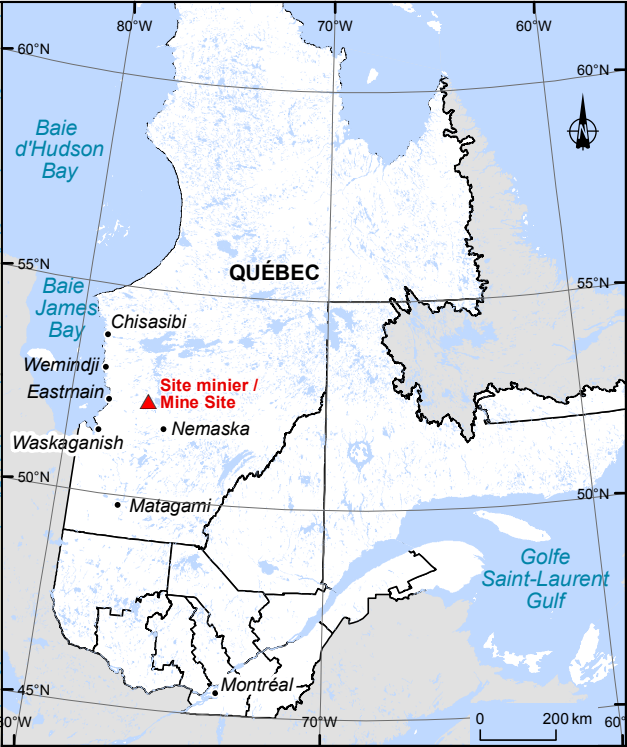
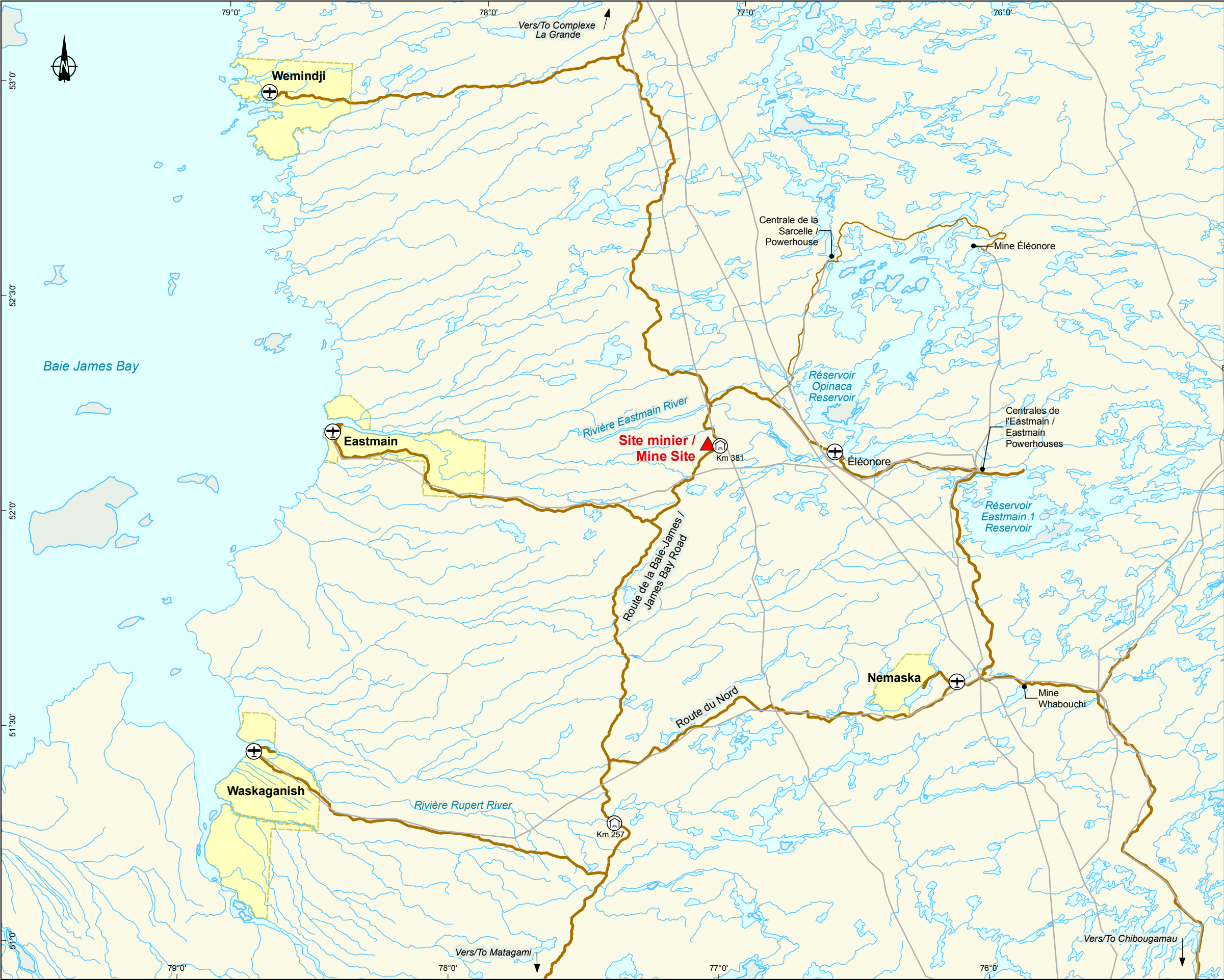
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## 2.4 LAND OWNERSHIP

The James Bay Lithium Mine Project site is located on lands referred to under Quebec law as being "lands of the domain of the State" (in other words, lands of the public domain owned by Her Majesty in right of the Province of Quebec). Wholly owned subsidiaries of Galaxy Resources, including the project proponent, Galaxy, are the holders of the mining claims currently comprising the Project Property.

The land covered by each of the 54 mining claims presently comprising the Project Property is a map designated cell and the total area of the lands covered by said claims is 2,163.75 hectares (Map 2). The current 2-year terms of the 54 mining claims will expire at various dates between March 2018 and June 2020. Although such terms can be renewed at their expiration for additional 2-year terms, it is contemplated that an application for a mining lease under section 100 of the Québec Mining Act (CQLR, c M-13.1) will be filed for an open pit mining operation and a concentrator with an annual production capacity of 2,000,000 t. This application will be submitted to Quebec's Ministère de l'Énergie et des Ressources naturelles (MERN).





- Site minier / Mine site
- Terres de catégorie II / Category II land
- Infrastructures**
  - Relais routier / Truck stop
  - Aéroport / Airport
  - Ligne de transport d'énergie / Transmission line
  - Route / Road
  - Route d'accès / Access road

**Résumé de la description de projet /  
Summary of Project Description**

Mine de lithium Baie James /  
James Bay Lithium Mine

**Localisation régionale du site minier /  
Regional Location of the Mine Site**

**Sources :**  
Canvec, 1 : 50 000, RNCan, 2015  
BDGA, 1 : 1 000 000, RNCan, 2011

No Ref : 171-02562-00\_wspT017\_c1\_ResDP\_locReg\_171013.mxd

0 10 20 km  
UTM 18, NAD83

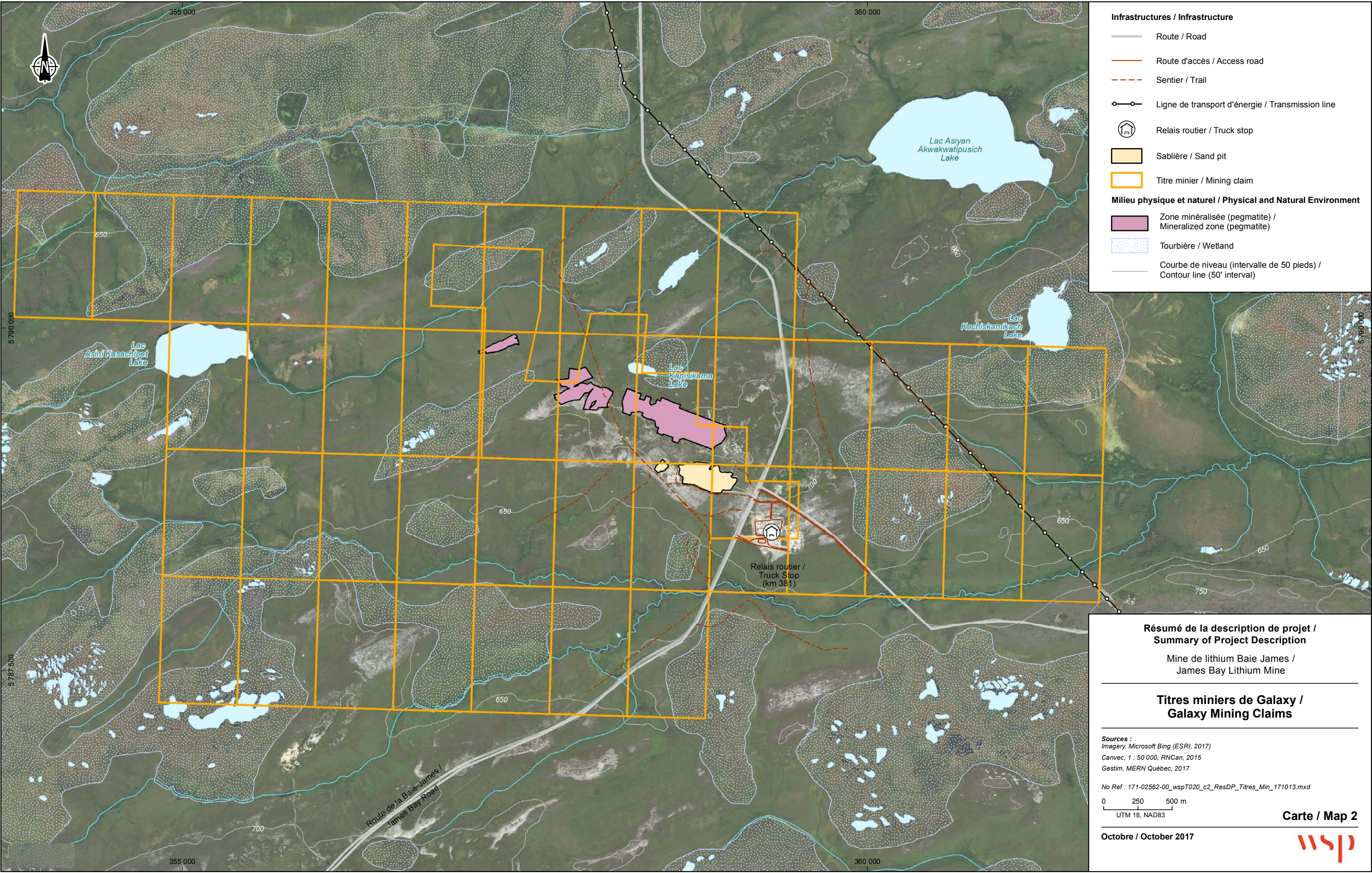
**Carte / Map 1**

**Octobre / October 2017**













# 3 PROJECT DESCRIPTION

The following infrastructure is planned for the James Bay Lithium Mine Project. The project parameters are documented in parentheses. These are considered to be conventional facilities for an open pit mining operation and include the following:

- An open pit (75.5 ha);
- A 2,000,000 t/yr spodumene concentrator (36.5 ha) (equivalent to an average of 5,480 t/day);
- Overburden (19.9 ha), ore, dry tailings and waste rock (combined for 168.3 ha) and spodumene concentrate stockpiles;
- Raw and process water retention basins;
- Administrative and operations buildings;
- Accommodation camp (9 ha);
- Hazardous substances storage (fuel, chemicals);
- Maintenance facilities for maintenance and repair of mining equipment, including spare part warehousing, laboratories, and emergency services facilities (fire and medical).

There is no existing infrastructure on-site. The ore and spodumene concentrate stockpiles will be located near the concentrator in the area delineated for this purpose. All on-site work and the location of the infrastructure will be designed to comply with the required minimal setback distance (60 m) from any lake or watercourse.

The management and supply of the explosives required for the mine will be supplied by a certified sub-contractor; however, all permit requests for its use will be made by Galaxy in compliance with the Federal *Explosives Act* and the Provincial *Act Respecting Explosives*.

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## 3.1 OPEN PIT MINING

The James Bay Lithium Mine project consists of the operation of an open pit mine (Map 3) with resources currently calculated to a depth of 225 m. The waste rock / ore ratio will be confirmed upon completion of the mine plan but is currently estimated at 4:1. Galaxy will continue its exploration drilling program on the James Bay Lithium Mine Project site to identify other economically feasible pegmatite ore deposits. The mine life is estimated at 20+ years; however, this needs to be confirmed following the release of revised ore resources later in 2017.

The ore will be mined from an open pit using conventional mining methods. Ore and waste rock mining will be done using drill rigs followed by blasting. Tracked excavators will be used to load 100 t trucks that will carry ore for processing at the spodumene concentrator. The waste rock will be transported to one of the designated waste rock stockpiles.

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## 3.2 ORE PROCESSING

The ore treatment process used on-site will allow for the concentration of spodumene. The concentrator is where the spodumene ore (in the order of 1.3% Li<sub>2</sub>O) will be transformed to approximately 6.0% Li<sub>2</sub>O concentrate. The process selected (Figure 1) is similar to the process currently used at Galaxy Resources' Mt Cattlin mining operation in Australia where crushing of the ore is followed by dense media separation (DMS). The expected recovery is 75% for a spodumene concentrate of approximately 6% Li<sub>2</sub>O. This process offers two sizable advantages: it does not require milling typical of conventional flotation circuits and no chemical reagents are used in the process. The ore treatment process consists of a circuit that contains the following key areas:

- Three stage crushing circuit;
- Primary DMS plant;
- Secondary DMS plant;
- Dewatering/filtration and combined dry stack tailings disposal system (with waste rock disposal);

- Water, air and ancillary services;
- Spodumene concentrate stockpile and dispatch system.

Figure 2 presents a preliminary outline of the currently contemplated concentrator site, area highlighted in brown on Map 3.

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### 3.2.1 CRUSHING

Ore will be fed to a three stage crushing operation comprising of a primary jaw crusher, a dry multi-deck sizing screen, secondary and tertiary crushers delivering crushed ore to a fine ore storage bin, producing crushed ore < 10-14 mm (maximal size will be confirmed following testwork) to be fed to the DMS processing plant.

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### 3.2.2 DMS

The DMS processing plant is fed from the fine ore storage bin via vibrating pan feeders and a sizing screen feed conveyor. The ore sized between 1 mm and-10 mm (or up to 14 mm depending on upcoming test results) is fed to the primary and then the secondary DMS circuits. The < 1 mm material is sent directly to the tailings via the dewatering/filtration circuit, the dry stack is then transferred to a combined dry tailings and waste rock stockpile.

Prior to feeding the DMS cyclones, the ore is mixed with ferrosilicon (FeSi) slurry. The FeSi acts as a densifying medium which enhances gravity separation of spodumene from minerals with a lower density. Spodumene is denser than the waste minerals and therefore sinks, while waste material floats. The primary DMS cyclone overflow streams are dewatered over a series of static and vibrating screens, where the FeSi is recovered. The dewatered waste products are combined with the dewatered < 1 mm material and conveyed via the dry stack tails conveyor to the dry stack tailings and waste rock stockpile. The primary DMS cyclone underflow streams are dewatered over a series of static and vibrating screens and the FeSi is recovered via screen undersize and the magnetic recovery circuit.

The dewatered primary products report to the stage 2 DMS cyclone feed boxes, where the process is repeated a second time. After processing, the spodumene concentrate is stockpiled and dispatched to customers.

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## 3.3 STORAGE AREAS

The James Bay Lithium Mine Project requires areas to stockpile ore, waste rock, dry tailings, spodumene concentrate and overburden. A dry tailings management facility area will be constructed on the mine site to store both waste rock and dry tailings. All storage areas will be designed and located to minimize their impact on the environment. Surface drainage channels will be built to divert water from the ore, waste rock / dry tailings, spodumene concentrate and overburden stockpiles. The same strategy will be used to manage the surface water around all the site infrastructure, such as the concentrator plant, buildings and access roads.

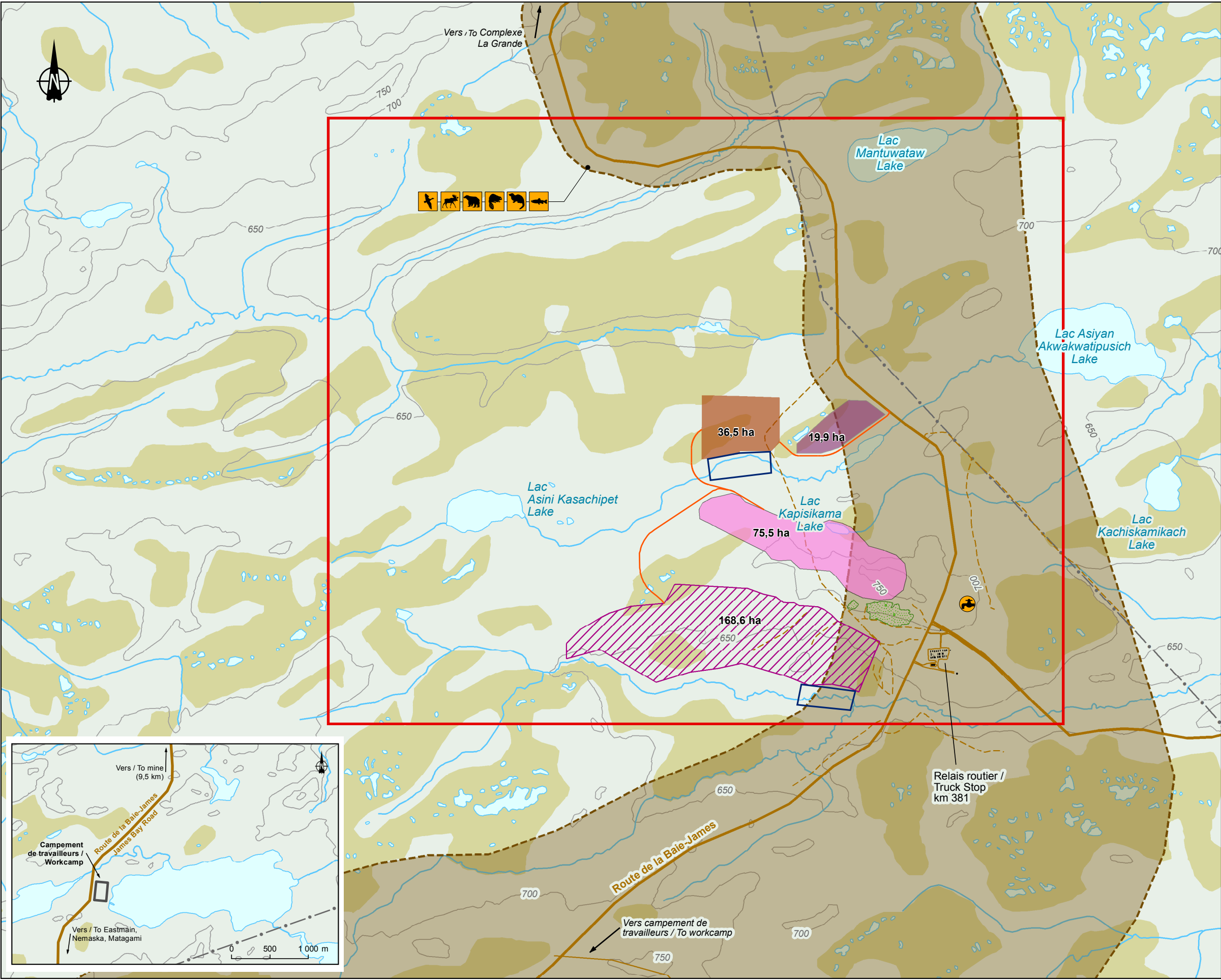
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## 3.4 PROJECT EXECUTION PHASES

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### 3.4.1 CONSTRUCTION PHASE

Stripping and clearing work will be needed to provide sufficient space for the concentrator site, the open pit and the waste rock and dry tailings stockpile. Overburden will be stored separately to be reused in rehabilitation. Work site activities will include procurement activities, implementation of an environmental monitoring program, building new access roads and a worker camp. Auxiliary infrastructure will also be needed such as a power and telecommunication distribution system.



- Zone d'étude / Study area**
- Utilisation du territoire par les cris / Cree Land Use**
- Source d'eau potable / Drinking water source
- Chasse, pêche et trappage / Hunting, Fishing and Trapping**
- Aire faunique / Wildlife area
- Original / Moose
- Ours / Bear
- Oie / Goose
- Castor / Beaver
- Autres animaux à fourrure / Other fur bearing animal
- Poisson / Fish
- Infrastructures / Infrastructure**
- Route / Road
- Route d'accès / Access road
- Sentier / Trail
- Ligne de transport d'énergie / Transmission line
- Bâtiment / Building
- Sablère / Sand pit
- Milieu physique et naturel / Physical and Natural Environments**
- Tourbière / Wetland
- Courbe de niveau (intervalle de 50 pieds) / Contour line (50' interval)
- Composantes du projet / Project Components**
- Concentrateur (avec bassins de collecte de l'eau brute et de procédé) / Concentrator (including raw and process water ponds)
- Étendue projetée de la fosse à ciel ouvert / Extent of proposed open pit
- Halde de mort-terrain / Overburden stockpile
- Halde de stériles et de résidus miniers / Waste rock and tailings stockpile
- Secteur potentiel de localisation d'un effluent minier / Potential area for the positioning of a mine effluent
- Accès projetés / Projected access

**Résumé de la description de projet / Summary of Project Description**

Mine de lithium Baie James / James Bay Lithium Mine

**Emplacement des infrastructures minières projetées / Extent of Proposed Mine Infrastructure**

**Sources :**

Canvec, 1 : 50 000, RNCan, 2015

BDGA, 1 : 1 000 000, RNCan, 2011

No Ref : 171-02562-00\_wspT023\_c3\_ResDP\_Infra\_171013.mxd

0 350 700 m

UTM 18, NAD83

**Carte 3 / Map 3**

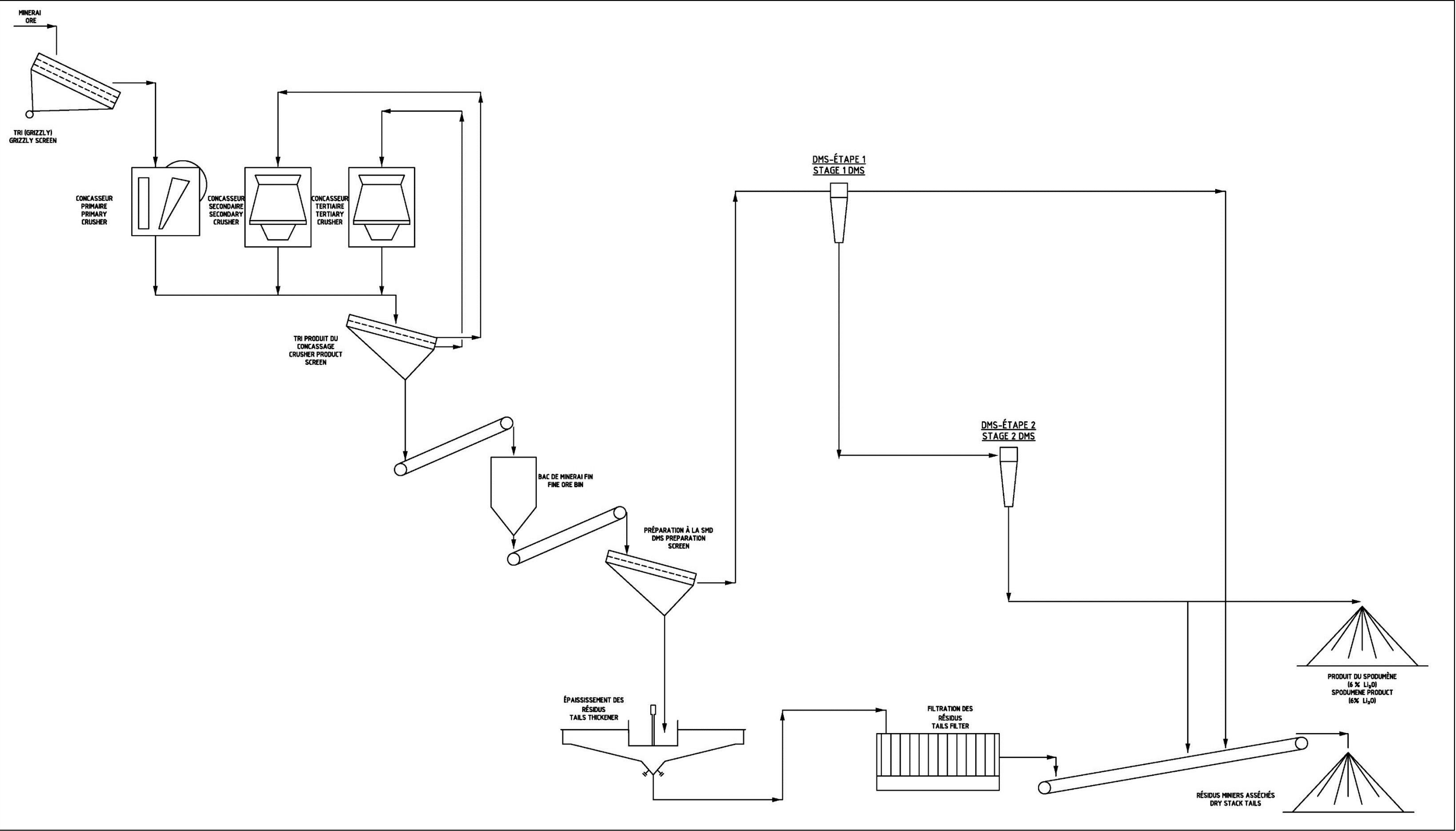
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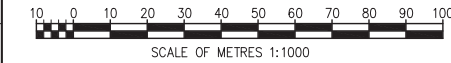
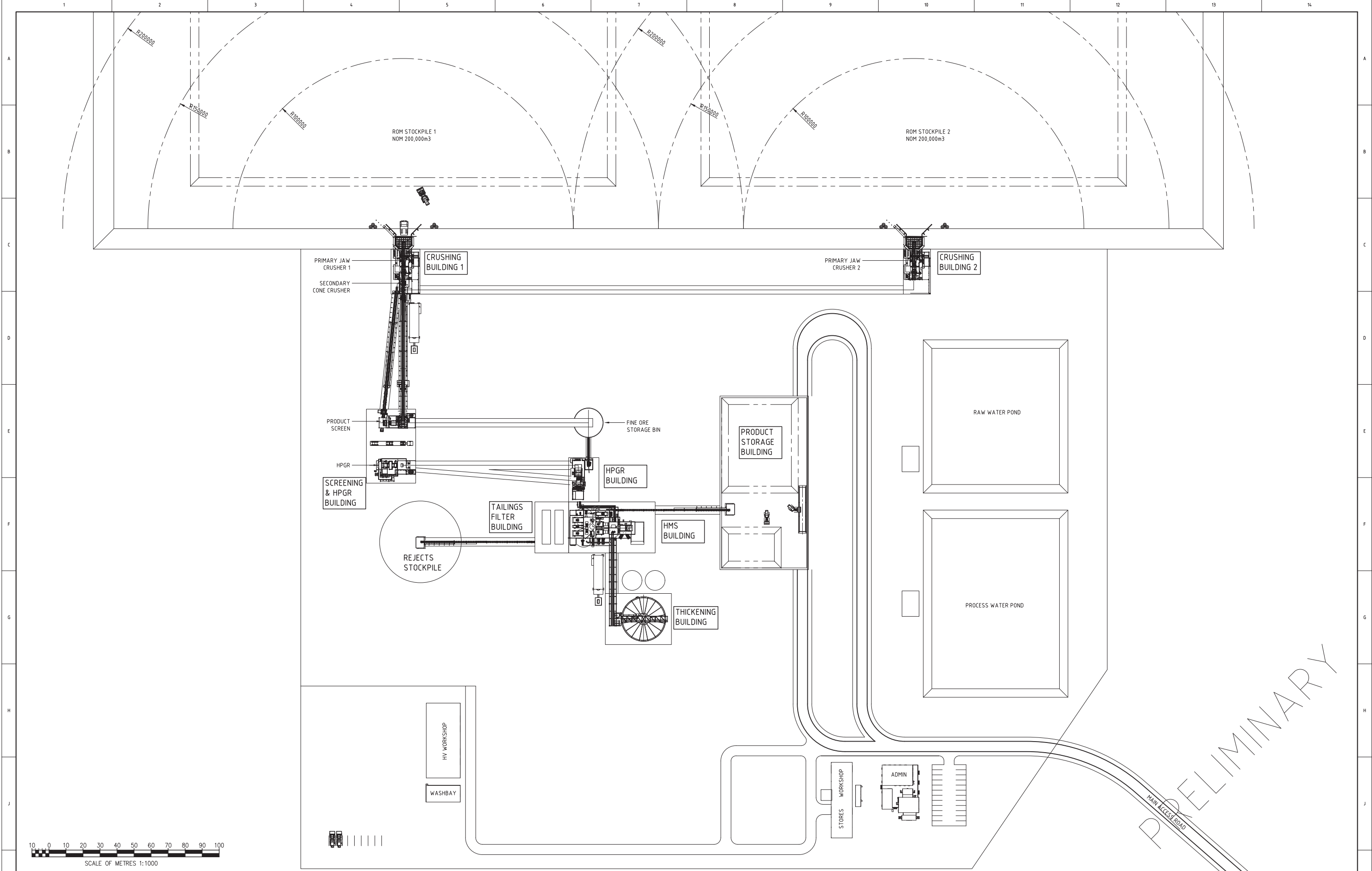




Figure 1 Ore Concentration Process







										<div><div>PRIMERO</div><div>primero.com.au   DESIGN   CONSTRUCT   COMMISSION</div></div>	DRAWN	B. GRIGSBY 15.03.17	PROJECT: JAMES BAY LITHIUM MINE												
											CHECKED	-	TITLE: B PLAN Figure 2 : Preliminary Concentrator Layout / Configuration préliminaire du concentrateur												
											DESIGNED	-													
											TECH. APP.	-													
											PROJ. APP.	-													
										CLIENT APP.	-														
REFERENCES										DRG No.	REV	DATE	REVISION	DRN	CHK	DES	TECH APP	PROJ APP	A1	SCALE	1:1000	DRG No.	15105-100-DRG-GE-001	REV	A
											B	08.08.17	RE-ISSUED	BG	-	-	-	-							
											A	20.06.17	PRELIMINARY DISCUSSION ISSUE	BG	-	-	-	-							



The work will include construction of the various buildings, namely the concentrator, maintenance workshop(s), administrative offices and other ancillary buildings. Water management infrastructure (ditches, ponds, water treatment plant) will also be built during this phase.

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### **3.4.2 OPERATION PHASE**

The development of the open pit will require drilling and blasting. Ore and waste rock will be loaded and hauled. The waste rock will be stockpiled immediately. Ore will be sent for processing to produce the spodumene concentrate. Tailings derived from the ore processing will be dried and then stored in the combined waste rock and tailings stockpile. During mining activities, the pit will be dewatered, with pit water pumped into water retention basins. In addition, the water runoff of the mine infrastructure will be collected and redirected to water basins prior to its discharge into the natural environment.

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### **3.4.3 REHABILITATION PHASE**

During rehabilitation, all mining infrastructure will be demolished. The site will be rehabilitated to pre-existing conditions. A mine rehabilitation plan will be prepared prior to this activity. It will be submitted to the Ministère de l'Énergie et des Ressources Naturelles for approval. This plan will be prepared in compliance with applicable requirements.

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## **3.5 EMISSIONS, DISCHARGES AND WASTE**

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### **3.5.1 ATMOSPHERIC EMISSIONS**

Particulate matter will be generated or suspended during the mining operations. Hauling is likely to be the cause of most particulate matter emissions on-site. Moreover, drilling and blasting will also generate particulate matter. Other possible contaminants include carbon monoxide, nitrogen oxide and sulphur dioxide emitted from diesel fuel consumption and the use of explosives.

A preliminary estimation of greenhouse gas emissions generated during operations was calculated to be 36 kt of CO<sub>2</sub>Eq per year. This equates to 12 Ml of diesel fuel and 3,000 t of explosives consumed yearly and excludes electricity production since the mine site will be connected to Hydro-Québec's grid. During the construction and rehabilitation phases it is estimated that 5 kt of CO<sub>2</sub>Eq and 3 kt of CO<sub>2</sub>Eq respectively will be emitted (corresponding to a consumption of 1.6 Ml of diesel in construction and 1.0 Ml of diesel in rehabilitation).

This assessment was inferred from the conversion factors of Environment and Climate Change Canada's Greenhouse Gas Inventory (diesel and CO<sub>2</sub>Eq conversion for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O). Galaxy Resources' data from its Mt. Cattlin operations in Australia, which are similar to what will be used, were scaled to the anticipated James Bay production.

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### **3.5.2 WATER MANAGEMENT**

Process water is used throughout the plant to wash and rinse screened material. Process water is recovered and recycled within the processing facility via the dewatering screens, tails thickener and tails filtration. Recirculation of the water is facilitated by the fact that no chemical reagents are present in the tailings following processing. Raw water will be used to top up the process water system as required. At present time, the raw water supply sources remain to be determined and several options are being assessed, including the following:

- Using water accumulated in the open pit, after settling to eliminate the suspended solids;
- Collecting storm water and/or groundwater for re-use.

Raw water make-up will be stored in a raw water pond. Surface water runoff around the infrastructure and from the stockpiles will be collected and directed to the raw water storage pond. The issue of the acid generating potential of the ore and waste rock is currently being addressed in the Feasibility Study. Representative samples of ore and waste rock will be collected and submitted to an accredited laboratory to determine their acid generating and metal leaching potential. The future intake and discharge points and their flows have not been determined, however the sectors where the mine effluent(s) could be located are provided on Map 3.

Environmental management tools and appropriate wastewater management will be applied on this project. The effluent will be treated, when required, to meet the applicable effluent discharge standards before being released to the receiving environment, including those specified in *Directive 019 for the mining industry* of the MDDELCC and the federal *Metal Mining Effluent Regulations* (MMER).

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### 3.5.3 WASTE MANAGEMENT

Domestic waste is likely to be produced at the mining site. At this point in time, the domestic waste management procedures are not defined it is expected they will be managed in the same fashion as domestic waste produced at the KM381 Truck Stop and transported offsite for disposal by third-party contractors. In addition to this waste, used oils and lubricants are likely to be found on-site. These will be contained and transported off-site to an appropriate disposal site by third-party contractors. Waste will be managed in conformity with the applicable regulations.

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## 3.6 OTHER INFRASTRUCTURE

For the development of this mining project, additional infrastructure related to the development and proper management of the site will be required. This will include the construction of an administrative and operations building. While exact location of these facilities has yet to be determined, the site layout presented in Map 3 identifies the expected layouts.

In addition, the workers will need to be housed on-site. A camp will be built that includes the installation and operation of both a potable and wastewater treatment system. A water supply (potable and process water) will be installed, and the water source (groundwater or surface water) is currently being studied.

For the mining operation, a tank farm will be required for the fuelling of the mining equipment, for heating purposes and for the backup generators. The capacity and precise location of this tank farm will be determined in the technical feasibility study.

Studies are currently underway to assess the power requirements for the mine site. Galaxy is planning to connect the mine site to Hydro-Québec's 69 kV electric distribution system. This could require up to 11 km of additional power lines depending on the route selection to be done by Hydro-Québec. Additionally, communication facilities will need to be developed since the site is not actually covered by cellular services.

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## 3.7 SITE REHABILITATION

Following the cessation of mining operations, restoration measures will be required to bring the receiving environment back as close as possible to its original state. Under Québec's *Mining Act* (RSQ, c. M-13.1), a mine restoration plan has to be filed with the MRNF before the start of any mining operations. These restoration measures include management of the mining complex, waste rock piles, tailings and water from the treatment ponds, and the demolition of infrastructure and of the administrative facilities. A progressive restoration approach will be deployed.

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## 3.8 PROJECT SCHEDULE

The preliminary schedule for the James Bay Lithium Mine project is as follows:

### 2011-2017

- Preliminary environmental surveys;
- Preliminary version of a Pre-Development Agreement (PDA) with the Grand Council of the Crees (Eeyou Istchee), the Cree Regional Authority (the “GCCEI-CRA”), the Cree Nation of Eastmain and Galaxy.

### 2018

- Completion of feasibility study;
- Preparation of the Environmental Impact Assessment study to be submitted in spring 2018;
- Execution of a Definitive Agreement between the Crees and Galaxy for the operation of the mine.

### 2019

- Public hearings and approval of the project;
- Construction phase.

### 2020-2040<sup>2</sup>

- Mining operations.

### 2041

- Restoration/closure phase.

### 2042

- Post-closure phase.

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<sup>2</sup> Subject to change following additional drilling and resource definition.





## 4 ENVIRONMENTAL COMPONENTS

Environmental baseline studies required for the James Bay Lithium Mine Project will be conducted in 2017. The preliminary list of environmental baseline studies includes the following environmental and social components:

- Fish and fish habitat, water quality and sediment quality;
- Soil quality;
- Hydrogeology (flow and quality);
- Hydrology;
- Geochemistry;
- Terrestrial fauna and avifauna;
- Flora;
- Archaeological potential.

The components of the environment and the major constraints to the project will be better defined when the environmental baseline studies are completed. Aboriginal land use will be documented and included directly into the environmental and social impact assessment study.

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### 4.1 PHYSICAL ENVIRONMENT

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#### 4.1.1 BEDROCK GEOLOGY

The James Bay Lithium Mine Project lies in the northeastern part of the Superior Province, within the Eastmain greenstone belt (Lower Eastmain Group) which consists predominantly of amphibolite grade mafic to felsic metavolcanic rock, metasedimentary rock and minor gabbroic intrusions. The ore deposit bedrock is composed of pegmatite dykes of albite and spodumene. These pegmatites are of the class “rare earth” elements (Li-Cs-Ta). They form a local group of intrusions in a host rock of shale and biotite gneiss that belong to a belt of greenstone approximately 420 km in length and from 10 km to 70 km in width that originated 2.723 billion years ago. This is the volcano-sedimentary belt of the Middle and Lower Eastmain (SRK Consulting, 2010).

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#### 4.1.2 SURFICIAL DEPOSITS

The nature of the overburden in the immediate area of the James Bay Lithium Mine Project is inherited from the sedimentary processes associated with the last glaciation, its deglaciation and the subsequent glacio-marine flooding of the territory by the Tyrrell Sea some 8,000 years ago. The highest areas in the sector correspond to outcrops of lithiferous pegmatites and are covered with a thin discontinuous till layer. The central section of the study area (south of the mineralized zone and in the area of the km381 Truck Stop) is covered by sand and gravel of glaciofluvial origin. Northeast of the mineralized zone, a relatively continuous cover of till forms the surface material. The till matrix is made up of silt and sand that constitutes 85 to 90% of the till, the remainder being represented by varying proportions of boulders, pebbles and gravel.

However, what characterizes the study area is the presence of flat basins where the silt and clay sediments were deposited during the postglacial flooding of the territory by the Tyrrell Sea. These sediments contribute to the poor drainage of these basins through the accumulation of water and organic matter. Extensive peat bogs (open and shrublands) have gradually invaded these basins to create the typical landscape that is observed in the region today.

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### 4.1.3 HYDROGRAPHY

The drainage in the area surrounding the project is characterized by two distinct entities, a first located north and, a second south of the rocky ridge of the James Bay ore body. The runoff of the northern edge of this ridge drains into a peat bog (Lake Kapisikama is part of the bog). The water from the peat bog percolates eastward into a 1.4-km-long drainage ditch that runs parallel to the James Bay Road. A culvert located at km 382 is located at the lowest point of this ditch and transfers the collected water east of the road. This water flows into the headwaters of the stream on the other side of the road that eventually flows into the Eastmain River, located approximately 11 km downstream.

South of the rocky ridge of the ore body, the surface waters drain towards the stream that crosses the James Bay Road at km 380 through a culvert. This stream collects the water from an extensive swamp and associated wetlands located on its south shore. It also appears to collect groundwater that surfaces some 30 m north of its shore. The stream eventually joins the northern stream (described in the previous paragraph) some 5 km downstream of the culvert.

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## 4.2 BIOLOGICAL ENVIRONMENT

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### 4.2.1 FLORA

The proposed mine site is characterized by numerous hills and valleys. Peat bogs and terrestrial communities composed mainly of jack pine and heaths are the prevailing vegetation. From the initial vegetation study undertaken in 2011, 611 ha out of a total of 1,654 ha inventoried were found to have been burnt. These forest fires occurred within the last 10 years, and as a result the natural regeneration was relatively poor. The black spruce stand on sphagnum moss (wooded peat bog) was the community most affected by those forest fires.

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### 4.2.2 FAUNA

#### TERRESTRIAL FAUNA

The habitat is characterized by a low population density for most species, since the environment is not very productive. The most common species of large mammals are black bear (*Ursus americanus*), moose (*Alces americanus*), Canadian lynx (*Lynx canadensis*) and wolf (*Canis lupus*).

In addition, the area is known to contain porcupine (*Erethizon dorsatum*), beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), American mink (*Neovison vison*), muskrat (*Ondatra zibethicus*), martin (*Martes americana*), red fox (*Vulpes vulpes*), otter (*Lontra canadensis*) and ermine (*Mustela erminea*), all species that are trapped by the Crees.

Also, seven different species of bats are likely to be present in the area surrounding the project.

#### AVIFAUNA

The presence and distribution of birds is likely to vary seasonally as well as with habitat availability for waterfowl and other aquatic birds, diurnal and nocturnal raptors and forest birds. Species of particular interest (those hunted by the Crees) are geese, ducks and ptarmigans. Many species of forest birds are likely to be encountered in the area. As well, several species of birds of prey have been seen, the most abundant species being the Osprey (*Pandion haliaetus*), the Red-tailed Hawk (*Buteo jamaicensis*) and the Northern Harrier (*Circus cyaneus*).

#### HERPETOFAUNA

One species of reptile, the striped snake (*Thamnophis sirtalis*), could be found in the vicinity of the project site, as could eight species of amphibians:

- American Toad (*Bufo americanus*);
- Wood Frog (*Lithobates sylvaticus*);
- Leopard Frog (*Rana pipiens*);
- Northern Frog (*Lithobates septentrionalis*);
- Green Frog (*Rana clamitans*);
- Spring Peeper (*Pseudacris crucifer*);
- Boreal Chorus Frog (*Pseudacris maculata*);
- Blue-spotted Salamander (*Ambystoma laterale*).

## AQUATIC FAUNA

The main species of interest for sport fishing in the area include Walleye (*Sander vitreus*), Northern Pike (*Esox lucius*), Lake Trout (*Salvelinus namaycush*) and Brook Trout (*Salvelinus fontinalis*). Some other species are potentially present but banned from fishing. They include: Lake Sturgeon (*Acipenser fulvescens*), Lake Whitefish (*Coregonus clupeaformis*), Sucker (*Catostomus* sp.) and Monkfish (*Lota lota*).

## SPECIES AT RISK

Six bat species at risk could be present in the study area:

- Northern Long-eared Bat (*Myotis septentrionalis*);
- Eastern Red Bat (*Lasiurus borealis*);
- Hoary Bat (*Lasiurus cinereus*);
- Eastern Pipistrelle (*Perimyotis subflavus*);
- Big Brown Bat (*Eptesicus fuscus*);
- Little Brown Bat (*Myotis lucifugus*).

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## 4.3 HUMAN ENVIRONMENT

The mining project is located in the administrative region of Nord-du-Québec on the territory of the Regional Government of Eeyou Istchee James Bay, which, as of 2014, entirely replaced the James Bay municipality. The territory of Eeyou Istchee James Bay includes the municipalities of Chapais, Chibougamau, Lebel-sur-Quévillon and Matagami, the three localities of Radisson, Valcanton and Villebois, as well as the Cree communities of Whapmagoostui, Chisasibi, Wemindji, Eastmain, Waskaganish, Mistissini, Nemaska, Oujé-Bougoumou and Waswanipi.

Northern Québec is governed by the JBNQA and the Agreement Concerning a New Relationship between the Government of Québec and the Cree of Québec, also referred to as the “Paix des Braves” (“Peace of the Braves”). The land regime introduced by the JBNQA is an important element in territorial use. It divides the James Bay territory into Category I, II and III lands. The project area is located on Category III land on which the Crees have exclusive rights to trap fur-bearing animals and have certain outfitting privileges, but not exclusive rights on such Category III lands.

The Cree community of Eastmain will be impacted since three trap lines located near the project are all linked to families residing in that community (RE2, VC33 and VC35). Most activities performed on the RE2 trapline are located along the James Bay Road. They include moose and goose hunting, beaver trapping, fishing, wood cutting, and blueberry picking. Drinking water supply, snowmobile trails, and goose ponds set by the tallyman were established in the close vicinity of the project. The Cree Nation of Eastmain is located about 100 km away from the proposed site. Information will be updated on traditional land use along these trap lines by their respective tallyman and its family.

As for the site themselves, a former landfill site in trenches (LETI - landfill isolated territory) is located where the mining pit will be located. This LETI's use is linked to the presence of the km381 Truck Stop. Waste will need to be relocated. The waste volume and its contents are not yet determined. Phase II Environmental Site Assessment work is planned at the site.



# 5 MAIN ANTICIPATED IMPACTS

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## 5.1 ANTICIPATED NEGATIVE IMPACTS

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### 5.1.1 CONSTRUCTION PHASE

The construction site itself will be the first source of impact that will last throughout the construction phase of the project. In addition, the site will meet the needs of the workers with a work camp, offices, temporary garage, temporary sanitary facilities, etc.

To install the various facilities, clearing, stripping, grading and excavation will be required. The construction of access roads, mine buildings (offices and concentrator) and related infrastructure (such as those required to manage water) will also result in some impacts (loss of vegetation, soil erosion, loss of nesting sites for migratory birds, etc.). The use of heavy machinery and blasting (if needed) are among the main sources of impacts.

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### 5.1.2 OPERATION PHASE

The open pit mine will have different sources of impacts:

- Pumping and disposal of mine water, including modifications to the surface drainage in the area (possibly impacting flow and fish species that inhabit these watercourses). It is impossible at this point in time to evaluate the impacts of this activity since the water demand, intake and effluent locations have not been established.
- Potential alterations to surface and groundwater quality from acid generation and/or metal leaching from the ore and waste rock piles (potentially impacting fish species that live in these watercourses). Metal leaching and acid generation results are unavailable at this time.
- Noise, vibration and air quality impacts associated with the movement and operation of heavy machinery (trucks, drills, excavators, etc.) and from blasting that could disrupt fauna and inconvenience land users (both aboriginal and non-aboriginal) in the area.
- Loss a Kapisikama Lake that is located in the area where the mining pit will be positioned.
- Modifications to the landscape.

Other related impacts associated with the mining operations will include the following:

- Increase in traffic on the James Bay Road since the concentrate will be trucked from the mine to a concentrate storage and handling facility located in the town of Matagami (an estimated 5 to 7 trucks per day).
  - Storage of hazardous materials, explosives and petroleum products that will present a risk to the environment (impacting soil and/or water quality). However, these substances and products will be managed safely in accordance with all applicable laws and regulations.
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### 5.1.3 CLOSURE PHASE

Rehabilitation work will be the last source of impact from the project. Impacts are likely to be similar to those identified at the construction phase and will include the use of heavy machinery, trucking and the increased possibility of various contaminants being released into the environment.

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## 5.2 PROPOSED MITIGATION MEASURES

Several mitigation measures will be implemented in order to reduce or limit the impacts on the receiving environment, for example:

- Regular maintenance and inspections of the heavy equipment to ensure that the exhaust systems are in good working order to reduce noise and air emissions generated by the equipment;
- Limit heavy equipment traffic in the work areas;
- Minimize idling when vehicles are not in use;
- Develop a fish habitat compensation program;
- Conduct inventories at the sites of archaeological potential prior to the commencement of any work;
- Inform and consult the Cree Community of Eastmain as well as the Cree Regional Authority continually through the project development.

When all project components have been determined, mitigation measures will be developed to prevent both surface and groundwater contamination. The acid generation potential and metal leaching potential test work will be conducted as part of the feasibility study. The results of these tests and the requirements for specific mitigation measures, if required, will be included in the environmental impact assessment report.

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## 5.3 ANTICIPATED POSITIVE IMPACTS

The positive impacts and economic benefits of this mining project include the following:

- Significant demand for procured goods, both locally and regionally throughout the construction and operational phases of the project;
- Awarding of contracts to a variety of qualified contractors in the region during construction, thus contributing significantly to both the local employment and regional economic development of the region;
- Awarding of local and regional service and procurement contracts in the operational phase for transportation and equipment maintenance contributing significantly to both the local employment and regional economic development of the region;
- Significant job creation during the construction and operation phases which will likely result in structuring impacts on the development of Eastmain and other surrounding communities;
- The community, the region, the province and the federal government will all benefit from significant income tax and property tax revenues generated by the project;
- In the long run, the project is expected to yield significant positive new technological developments for the region in terms of large-scale exploration and mining operations;
- Improved communication services to the region required to support mining operations.

## 6 PUBLIC CONSULTATION

As part of this project, information sessions are to be held with the various communities and stakeholder organizations. A communication and information program is being prepared by Galaxy in compliance with the Mining Policy developed by the Eeyou Istchee Crees (GC/CRA, 2010).

Over the past few years, the Aboriginal communities have demonstrated an increasing interest in taking part in economic development projects. In the Haida and Taku River decisions, the Supreme Court of Canada requires that Aboriginal communities be consulted and that their concerns be considered without the communities having to prove their rights, either by title to the land or by ancestral rights.

In February 2011, the first James Bay Lithium Mine project presentation and information session was held in Eastmain. It should be noted that the Eastmain Band Council was notified of the project in early 2011.

In August 2011, Galaxy Resources met with the Grand Council of the Crees (Eeyou Istchee) and the Cree Regional Authority (GCCEI-CRA) to initiate the discussion process under the Cree Nation Mining Policy (GC/CRA, 2010). This policy requires negotiations with mining companies to allow for a Cree integrated approach to mining. At this meeting, the designated Cree representatives responsible for mining were identified for the negotiation process.

In November 2011, Galaxy Resources notified then Chief Edward Gilpin of the proposed environmental baseline sampling program activities on the project site and he approved the initiative. Galaxy Resources also met with the Eastmain Band Council during which an overview of the project was presented.

In January 2012, a first review meeting was held with the GCCEI-CRA representatives and Galaxy Resources. A Pre-Development Agreement (PDA) was prepared and negotiated and was ready for signature. However, it was not signed, as the project was put on hold due to a decrease in the price of lithium which made the project no longer economically viable.

Interviews were held in 2011–2012 with the tallymen of the potentially impacted traplines in Eastmain in order to depict land use:

- Trapline RE2: Most activities are located along the James Bay Road. They include moose and goose hunting, beaver trapping, fishing, wood cutting, and blueberry picking. There are also a drinking water supply, snowmobile trails, and goose ponds in this area.
- Trapline VC33: Along the Eastmain River, valued wildlife area used for moose hunting, beaver trapping, and fishing.
- Trapline VC35: The tallyman needs to pass by km 381 to access his trapline and does not want blasting to block off road traffic on the James Bay Road. The tallyman is also worried about cumulative environmental impacts and the use of the trapline by mine workers.
- Trapline RE1: Area not in use by local tallyman.

Public consultations were held in Eastmain from February to April 2012. Interviews were completed with 11 representatives from various administrative and public service organisations. Also, three focus groups were held by selecting participants taking into account age and gender. Concerns and expectations expressed by the Cree community were:

- Mining wealth and revenue sharing – Fair sharing with community members of wealth and revenue from mining development is expected, through jobs, contracts, compensation, and donations.
- Training – Proper training of community members in order to increase qualification levels for the mining hiring process (especially for youth) before the project starts. Training should be offered in Eastmain.
- Water quality and land resources – Assessing risks and impacts associated with mining is required.
- Consultation and information – Improving people's knowledge of the project approval process, the Environmental Impact Assessment (EIA), the remedial measures, and the lithium extraction process is needed; optimising information tools and communication activities according to Cree needs is required.
- Land use – Maintaining land users' traditional activities despite is expected mining activity.

- Mining site restoration – Ensuring the continuation of land use for the future generations at the mine site by planning and implementing a closure and restoration plan.
- Work camp and alcohol – Limiting problems in relation to alcohol consumption in the work camp is expected. Cree workers would like to have a dry work camp.

Since 2012, one additional public consultation session was held, in May 2017. That meeting's objective was to reintroduce Galaxy and the project. The Eastmain Band Council and local tallyman were present. They raised the following items:

- Impacts that the mine could have on wildlife;
- Information sharing needs to be continuous and the Eastmain community/local tallymen should be involved;
- Employment opportunities and training programs that would need to be developed prior to the mine opening;
- Cumulative impacts since the area has already undergone changes with hydro development.

As part of the project's environmental and social impact assessment process, it is planned that meetings be held with the local population and its representatives to gather their inputs and discuss their concerns with regards to the project. Interviews with representatives from non-Native organisations of Jamesie will also be conducted. As indicated above, a consultation schedule will be developed in the coming months.



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