JAMES BAY LITHIUM MINE

ENVIRONMENTAL IMPACT ASSESSMENT

CHAPTER 7: IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

JULY 2021 (VERSION 2)

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7 IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

7.1 IMPACT ASSESSMENT METHOD

The general approach used to identify, analyze and mitigate environmental impacts (or improve them when these are positive) relies on a sound knowledge of the project and the receiving environment, on the experience acquired during the construction, operation or follow-up of similar projects. The approach covers the following elements:

- Knowledge of the project allows us to identify sources of impact based on the technical properties of the structures to be built and work to achieve (construction phase), operation modes (operation phase) and rehabilitation work (rehabilitation phase), when necessary, in addition to the activities and timelines associated with the various phases.
- Description of the environment (physical, biological and human) allows us to understand the project's environmental and social context and identify its most sensitive components.
- The consultation of stakeholders affected by the project allows us to survey their expectations and concerns, in addition to gaining a thorough knowledge of the environment, which leads to, considering the knowledge acquired on the receiving environment, an identification of the major issues linked to the project.
- Experience acquired during the execution of past projects provides information on the nature and intensity of impacts associated to this type of project, and on the effectiveness of the mitigation, improvement and compensation measures normally used.
- Concurrently, these different types of knowledge automatically mitigate the number and magnitude of the impacts likely to occur, since the project is subject to an optimization process at its planning stage.

Note that differences in views between experts **in charge of the impact assessment** and the population concerned by the project**, particularly members of the First Nations,** can arise at the impact assessment stage. The following sections report these differences, among other things, when these were observed.

Comments gathered during consultations with Tallymen, land users and other members of the Cree Nations, mainly from Eastmain and Waskaganish, were taken into account at various stages of the impact assessment: identification of environmental components likely to be affected by the project, delineation of the assessment area, assessment of anticipated impacts, and selection, improvement and addition of proposed mitigation measures.

Furthermore, at the suggestion of the Eastmain Cree Nation, in order for members to improve their mining knowledge and to better assess the impacts of the project, an introductory course on mining and lithium was offered to the community by Galaxy on July 11, 12 and 13, 2018. Additional project development briefings were conducted throughout the development of the project (Chapter 5).

Appendix I details the mitigation measures proposed by the Cree First Nations and other regional stakeholders, and how Galaxy took them in account throughout the consultation process and project optimization.

7.1.1 KEY ELEMENTS

7.1.1.1 SOURCES OF IMPACT

The sources of impact represent project components likely to have effect on the environment. We can distinguish them, based on whether they are linked to the construction, operation or rehabilitation phase. The construction phase will not only include mining complex construction activities (infrastructure), but also preliminary activities required to mine the deposit (clearing, stripping of overburden and surface waste rock, etc.). The sources of impact also take into account the presence and functioning of the project's infrastructure, throughout its operation and also during rehabilitation work to ensure site closure according to regulations established.

Some sources of impact are negative while others are positive. Table 7-1 presents the sources of impact related to the project.

Table 7-1 Project impact sources

Construction phase	
Site preparation and infrastructure construction	Stripping of natural soils, clearing, excavation and grading work, work in aquatic environment. Presence of site trailers and construction of temporary or permanent infrastructure (buildings, storage areas, access roads, mining infrastructure foundations, construction of buildings and of road for ore transport, etc.).
Water management	Management of runoff or other on the site during construction work.
Hazardous and waste materials management	Handling, management of hazardous and waste materials to eliminate, recycle or reuse. Also, management of accidental spilling of hazardous waste related to overall activities.
Transportation and traffic	All transportation on site, refueling as well as local traffic **and on the Billy-Diamond highway**. Also, use of equipment (bulldozers, drills, excavators, etc.) required on the site.
Economic development and presence of workers	Hiring of labour and presence of workers at the mine, purchase of goods and materials and granting of contracts for various services.
Operation phase	
Presence and operation of the pit	Process plant feed material and waste rock drilling, blasting and extraction activities.
Other infrastructure and equipment in operation	Concentrator, garage for mechanical maintenance, administrative offices, water treatment plant, explosive **warehouse**, worker camp, generators, etc.
Management of process plant feed material, overburden and waste rock	Storage of process plant feed material, overburden, waste rock and **tailings** in accumulation areas intended for that purpose, **disposal of tailings in mined-out portions of the pit** and ongoing restoration when possible.
Water management	Dewatering of the pit, management of water at the plant, on the mining site and toward a natural environment (final effluent).
Hazardous and waste materials management	Handling, management of hazardous and waste materials to eliminate, recycle or reuse. Also, management of accidental spilling of hazardous waste related to overall activities.
Transportation and traffic	All transportation on the site, refuelling, local traffic **on the Billy-Diamond highway** and transporting of spodumene concentrate to Matagami, and use of heavy equipment on the site (bulldozers, drills, excavators, etc.).
Economic development and presence of workers	Hiring of workforce and presence of workers at the mine, purchase of goods, services and materials for mining operations.

Table 7-1 Project impact sources (cont.)

Rehabilitation phase	
Infrastructure dismantling	Work linked to the dismantling of plant and related facilities.
Pit rehabilitation	Flooding and securing of the pit.
Water management	Water intake and wastewater treatment, if necessary and rehabilitation of site, etc.
Hazardous and waste materials management	Handling, management of hazardous and waste materials to eliminate, recycle or reuse. Also, management of accidental spilling of hazardous waste related to overall activities and soil decontamination work if necessary.
Transportation and traffic	All transportation on the site, demolition materials to be removed from the site, local traffic **on Billy-Diamond highway**, as well as use of heavy equipment on the site (bulldozers, drills, excavators, etc.).
Economic development and presence of workers	Hiring of workforce for site rehabilitation and purchases required for completion of the work.

7.1.1.2 ENVIRONMENTAL COMPONENTS

Identifying the environmental components, using inventories from the study area, will serve to draw up of a list of elements from the physical, biological and social environments likely to be affected by one or several sources of impact related to the project. These components are presented in Table 7-2.

Since a valued component is considered to be an element of scientific, social, cultural, economic, historical, archaeological or aesthetic importance, the elements valued by the First Nations were considered in the EIA. The main elements valued by the Cree First Nations are included in the corresponding environmental components, and concern:

- **water quality (particularly the Eastmain River and creek CE5);**
- **air quality;**
- **soil quality;**
- **fauna quality in general (in particular beavers, moose, geese, sturgeon, trout and porcupines);**
- **quality of vegetation consumed by users and animals (including medicinal plants and berries);**
- **territorial integrity;**
- **quality of life at the camp (health, dust, noise).**

7.1.2 ANTICIPATED IMPACTS OF PROJECT

Project impacts are determined using a grid that establishes links between sources of impact and environmental components. The exercise allows us to identify the environmental components likely to be affected by the facilities or activities planned.

Environmental protection measures integrated from the moment of project design are considered in determining potential impacts. The grid on impact interrelationships is presented in Table 7-3. Each box in the grid shows the project component from which the potential impact can occur on an environmental component.

7.1.3 IMPACT ASSESSMENT

Impact assessment consists in determining, during the various stages of the project, the significance of the anticipated impacts on the physical, biological and social environment. This assessment considers measures incorporated at project design, in addition to applicable mitigation and improvement measures, and focuses on impacts that persist following application of these measures, that is, residual impacts.

Three criteria are analyzed to measure the significance of the impact:

— Intensity of impact;
— Extent of impact;
— Duration of impact.

Details of the assessment criteria are presented below.

Table 7-2 Identification of environmental components of project

Physical environment		
Soil		Physicochemical and stratigraphic properties of surface deposits and vulnerability of soil to erosion and contamination and their stability.
Water	Hydrogeology	Natural gravity flow (water table) or induced (draining or pumping) of groundwater.
	Hydrological regime	Movement and renewal of surface water, watercourse hydrology and hydraulics.
	Water and sediments	Physicochemical properties of surface water, groundwater and sediments and their vulnerability to contamination.
Air	Atmosphere	Physicochemical properties of air, including dust concentration and GHG emissions.
	Artificial light at night	Ambient night-time lighting level
	Ambient noise	Ambient noise level properties.
	Vibrations and overpressure	Air pressures and velocity of ground vibrations during blasting.
Biological environment		
Vegetation and wetlands		Land plant groups, hydrous environments, including species at risk from the study area.
Fauna	Large fauna	Moose, caribou, bears and their habitats.
	Small fauna and herpetofauna	Small land mammals and their habitats, including species at risk and species trapped by the Cree. All amphibians and reptiles.
	Ichthyofauna	Fish populations and their habitats.
	Avifauna	All bird species and their habitats, including species at risk.
	Bats	All chiroptera species (bats) and their habitats, including species at risk.
Social environment		
Current use of land and resources for traditional purposes		Traditional hunting, fishing, trapping and gathering activities by Indigenous people.
Infrastructure		Billy-Diamond highway, km 381 truck stop and SDBJ.
Perception of physical environment		Air and water quality, ambient noise, night-time lighting, vibrations and overpressure.
Quality of life		Lifestyle, social environment and health-care services.
Local and regional economy		Jobs and businesses.
Heritage and archaeology		Natural heritage (protected areas), areas of archaeological potential and incidental findings.
Landscape		Landscape units and visual integrity.

Table 7-3 Grid on anticipated impact interrelationships

			Construction phase					Operation phase							Rehabilitation phase					
			Site preparation and infrastructure construction	Water management	Hazardous and waste materials management	Transportation and traffic	Economic development and presence of workers	Presence and operation of the pit	Other infrastructure in operation	Management of economic material, overburden and waste rock	Water management	Hazardous and waste materials management	Transportation and traffic	Economic development and presence of workers	Dismantling of infrastructures	Rehabilitation of the pit	Water management	Hazardous and waste materials management	Transportation and traffic	Economic development and presence of workers
Environmental components	Physical environment	Soil	—		—					—		—			—			—		
		Hydrogeology	—	—				—	—	—	—				—	—	—			
		Hydrological regime	—	—				—	—	—	—				—	—	—			
		Water and sediments	—	—	—	—		—	—	—	—	—	—		—	—	—	—	—	
		Atmosphere	—		—	—		—	—	—		—	—		—	—		—	—	
		Artificial light at night	—			—		—	—	—			—		—				—	
		Ambient noise	—			—		—	—	—			—		—	—			—	
		Vibrations and overpressure	—					—												
	Biological environment	Vegetation and wetlands	—		—	—		—		—		—	—		+				—	
		Large fauna	—		—	—	—	—	—	—			—	—	—				—	—
		Small fauna and herpetofauna	—	—	—	—		—	—	—		—	—		—		—	—	—	
		Ichthyofauna	—	—	—	—		—			—	—			—		—		—	
		Avifauna	—			—		—	—	—	—		—		—				—	
		Bats	—			—		—	—	—			—		—				—	
	Social environment	Use of land and resources for traditional purposes	—			—	—	—	—	—	—		—	—	—				—	—
		Infrastructure				—	+						—	+					—	+
		Perception of physical environment	—	—		—		—	—	—	—		—		—	—	—		—	
		Quality of life	—			—	+	—	—	—			—	+	—	—			—	+
		Local and regional economy					+							+						+
		Heritage and archaeology	—					—		—										
		Landscape	—			—		—	—	—			—		—	—			—	

Note — indicates a negative impact and + a positive impact.

INTENSITY OF IMPACT

Intensity of impact indicates the severity of disturbance on the environmental component studied.

This analysis considers the environmental component's properties (namely its sensitivity and resilience in the face of change) as well as its enhancement. The value associated with the environmental component considers its ecosystemic (only biological environment) and/or socio-economical role, as well as, the value assigned to it by the stakeholders consulted.

The environmental components which are subject to legal or regulatory protection, for which the protection is subject to a consensus or which play an essential role in their environment (ecosystem, sociocultural or economic environments, etc.) are considered as highly valuable. On the contrary, environmental components that fail to generate interest and whose conservation and protection are of little concern to the environment are considered as invaluable.

There are three levels of impact intensity:

- **High intensity**: the impact endangers the environmental integrity of the component or substantially or irreversibly changes the component or its use.
- **Moderate intensity**: the impact leads to a reduction in the quality or use of the component but does not compromise its environmental integrity.
- **Low intensity**: the impact imperceptibly destroys or changes the quality, use or integrity of the component in the environment.

Concerning the landscape, impact intensity is based on level of absorption and insertion of the project's equipment and structures in its environment.

EXTENT OF IMPACT

Extent of impact is based on the size of the territory or proportion of inhabitants affected. Extent can be regional, local or isolated:

- **Regional extent**: the impact affects the entire study area (or area larger than the study area) or a large proportion of its population **or several municipalities/villages in the region**.
- **Local extent**: the impact **affects a large proportion of the local study area within, near or some distance from the project footprint, or it is felt by a limited proportion of the population of the study area or surroundings**.
- **Isolated extent**: the impact affects a small area or a few individuals in the **local** study area **or it is only felt by a small proportion of the population (a few individuals) in or around the study area**.

Concerning the landscape, extent of impact is related to the observers' level of perception of the equipment and structures in the landscape.

DURATION OF IMPACT

Duration of impact refers to the period of time for which the impact of the project will affect the environment. These criteria include intermittence. Impact duration can be long, moderate or short:

- **Long-term**: the impact persists on a continuous or discontinuous basis during the entire project duration **(construction and operation, about 18 years)**. This is often a permanent and irreversible impact.
- **Moderate-term**: **the impact is felt temporarily, continuously or discontinuously during the construction phase as well as during the operation phase, but rather discontinuously. These are reversible impacts which still manifest themselves several months after the end of construction work and which could also affect the restoration period**.

— **Short-term**: **the impact is felt temporarily, discontinuously during the construction phase only or may slightly exceed the end of the construction phase, or only very limited and discontinuously during the operation phase. These are reversible impacts, the duration of which varies between a few days and a few months.**

For the landscape component, duration indicators are the same as those used for the other components.

MITIGATION, IMPROVEMENT AND COMPENSATION MEASURES

Note that the sound integration of the project in its environment is favoured as of the planning and design stage, thanks to the implementation of criteria or optimizations aimed at protecting the environment **and reducing impacts of the project on the components valued by the First Nations. The comments collected during consultation activities with tallymen, land users and First Nations communities throughout the project, made it possible to validate, improve and add measures**.

Therefore, mitigation measures aim to limit the negative impacts of the project on the environment, while improvement measures instead increase the positive impacts. As for compensation measures, these are implemented to compensate the loss or permanent disturbance of some environmental components.

The different measures are identified during the impact assessment exercise for each of the environmental components and allow for a more accurate assessment of the significance of the impacts.

An impact can either be positive or negative. However, only the significance of a negative impact is assessed. This significance is based on intensity, extent and duration of the disturbance. On completion of the assessment, significance is qualified as minor, moderate or major. If the assessment concludes to a significance less than minor, the impact is qualified as negligible.

ASSESSING IMPACT SIGNIFICANCE

As mentioned previously, significance of impact is the result of an overall judgment on the effect of a source of impact on an environmental component, **following application of the mitigation or improvement measures.**

Impact significance incorporates criteria linked to intensity, extent and duration and can be major, moderate or minor, as shown in Table 7-4. The impact significance rating grid is symmetrical since it includes the same amount of impacts of major significance as it does of minor significance (7 in each case) and 13 possibilities of moderate significance impacts.

For the landscape, although intensity and extent indicators differ from the other components, the same impact significance rating grid is used.

Moreover, when certain physical components fall within a regulatory framework, the latter is into account during impact analysis, although it disregards the notions of intensity, duration and extent. For example, the ambient noise impact analysis is based on Instructions Note 98-01 (MDDEP, 2006). Nonetheless, depending on the receiving environment, assessment criteria used to establish the significance of an impact will not be considered uniquely. In the end, the analysis is based on the same method as the one presented above.

Note that for some of the Cree having participated in consultation activities on intensity, extent and duration, the impact assessment differs and hence, significance could be greater for them. **It is mentioned in the text, when it is the case.** To respond to the concerns and worries **of the First Nation communities**, mitigation or improvement measures have been planned, including several environmental follow-ups to study component trends and assess the efficacy of the measures, as well as, communication methods to keep stakeholders informed of the results of these follow-ups. Furthermore, Galaxy remains open to reviewing the mitigation measures implemented and to adjusting them throughout the life of the project to adequately address the concerns of the stakeholders.

PRESENTATION OF RESULTS

For each environmental component identified and for each phase of the project, if applicable, the analysis and assessment of anticipated impacts are presented as follows:

- Source(s) of impact.
- Mitigation measure(s).
- Description of impact.
- Assessment of impact, if the impact is of a negative type.

For ease of reading, the mitigation measures for each project component are identified by a distinct code. The definitions of these mitigation measures can be found in Table 7-5, preceding the impact analysis. The same mitigation measure codes will be used in the impact analysis and assessment exercise (Table 7-5). Lastly, a summary of the impacts is presented at the end of the chapter. The results of the impact significance for each phase of the project are presented.

Table 7-4 Impact significance rating grid

Intensity	Extent*	Duration	Significance
High	Regional	Long	Major
		Moderate	Major
		Short	Major
	Local	Long	Major
		Moderate	High
		Short	Moderate
	Isolated	Long	Major
		Moderate	Moderate
		Short	Moderate
Moderate	Regional	Long	Major
		Moderate	Moderate
		Short	Moderate
	Local	Long	Moderate
		Moderate	Moderate
		Short	Moderate
	Isolated	Long	Moderate
		Moderate	Moderate
		Short	Minor
Low	Regional	Long	Moderate
		Moderate	Moderate
		Short	Minor
	Local	Long	Moderate
		Moderate	Minor
		Short	Minor
	Isolated	Long	Minor
		Moderate	Minor
		Short	Minor

* For the landscape, the regional extent corresponds to a large area, the local extent corresponds to a limited area and the point extent to a small area.

Table 7-5 List of applicable mitigation measures

Code	Description
Profile and ground surface	
SUR 01	Mark out the boundaries of the planned earthworks, restrict the areas of deforestation and soil stripping as well as cutting areas to the footprint of the required infrastructure (road, pits, stockpiles, basin, etc.).
SUR 02	Mark out access, paths and work areas before undertaking work, and prohibit parking and movement of machinery and vehicles outside of those areas.
SUR 03	Rehabilitate creek banks disturbed by the work as early as possible to minimize erosion and sedimentation. If it is impossible to permanently stabilize disturbed surfaces before winter, implement temporary protection measures.
SUR 04	In watercourse crossing areas, perform deforestation work immediately before construction to minimize erosion.
NOR 01	Restore work areas and stockpiles by levelling surfaces, covering them with natural soils, scarifying or seeding them to support revegetation. Stabilize reworked areas, embankment slopes, overburden stockpiles, etc., as work progresses. Reference: D019 for rehabilitation phase
Soil, water, and sediment quality	
QUA 01	Ensure that enough emergency kits for the recovery of petroleum products and chemicals are available in sensitive locations.
QUA 02	Through frequent inspections, ensure that machinery is in good working order (clean with no contaminant leaks) and that fuel and lubricant tanks are perfectly sealed. Any discovered leaks require immediate repairs to the tank in question.
QUA 03	The usual precautions should be taken during maintenance (draining, greasing, etc.) and refuelling of machinery on site to avoid any accidental spills. Maintenance is to be permitted only in authorized locations intended for that purpose (garage, mechanical workshop); refuelling is to take place in specifically designated areas.
QUA 04	In the case of temporary storage of contaminated excavated material, take all the necessary actions to preserve the integrity of the surrounding soil and water and ensure the safety of workers (put piles on a sealed or impermeable surface, cover piles, restrict access to these piles, etc.).
QUA 05	**Continuously stabilize or protect exposed surfaces as soon as possible in order to reduce the transport of suspended solids (revegetation) and to limit the leaching of materials.**
QUA 06	Establish a well system on the periphery of the mining infrastructure to measure the drawdown and the rise of the water table in the sector of the pit.
QUA 07	Carry out development work likely to alter the water quality of watercourses outside the snowmelt period (April 15 to June 15).
QUA 08	Limit the transport of fine particles in the water environment beyond the immediate work area by an effective means (sediment traps, sediment barriers, turbidity curtain, etc.).
QUA 09	Build a temporary bridge for machinery if crossing a watercourse is required. Set up bridging or an ice-bridge when building a trail across a watercourse or fish habitat (ref. NOR 05).

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Soil, water, and sediment quality (cont.)	
QUA 10	Equip all fixed equipment containing oils and/or fuel (lighting tower, generator, crusher, sifter, etc.) located less than 60 m from a watercourse or body of water with a leakproof recovery system. Equipment must be equipped with absorbents for quick and effective response in the event of an accidental spill.
QUA 11	Temporary facilities (e.g. construction site trailer, access road, storage areas, waste site) must be located more than 60 m from a watercourse.
QUA 12	Any vehicle and machinery maintenance is prohibited outside the designated areas.
QUA 13	**Refuel the vehicles and machinery at the places designated for this purpose and according to the good practices in force.**
QUA 14	**Monitor the quantity and quality of the water from the drinking water supply well of the km 381 truck stop and provide drinking water to the truck stop or drill a new drinking water well in the event that the drawdown renders the drinking water well of the truck stop unusable.**
QUA 15	**Manage the explosives warehouse so that there are zero releases:** **- Sanitary waste will be collected in a sealed pit and disposed of externally;** **- Used oils and other non-recyclable discharges will be disposed of externally by an authorized company for reclamation or disposal;** **- Trucks containing ANFO will be washed inside the building and the wash water will be sent to the oil separator and then filtered and recycled.**
NOR 02	Manage excavation waste according to their degree of contamination and in accordance with the requirements of the *Soil Protection and Rehabilitation of Contaminated Sites Policy*. Reference: Q-2, r. 37 – *Land Protection and Rehabilitation Regulation*: Schedules I and II and Response Guide – Soil Protection and Contaminated Sites Rehabilitation: Table 5 – Soil recovery methods authorized in Québec
NOR 03	**Dispose of contaminated excavation according to the contaminated soil management grid in the Intervention Guide. If disposal in the stockpile is a possible option, Galaxy will apply to the Ministry for authorization and will not act until authorization is obtained.** Reference: Q-2, r. 18 – *Regulation respecting the burial of contaminated soils*: Schedule I and Guide – Soil Protection and Contaminated Sites Rehabilitation: Schedule 5 – Excavated soil management grid; Section 6.4.3.1 List of authorized treatment facilities
NOR 04	Dispose of surplus or unusable excavation waste (clay, silt, gravel, rock) with due care and in accordance with the *Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains* and D019 to ensure adequate separation from water environments.
NOR 05	Install culverts or crossing structures designed to maintain the free flow of water (and the free passage of fish). The construction of bridges or the installation of culverts shall not reduce the width of the watercourse by more than 20%, as measured from the natural high-water mark. The base of the lower culvert shall be driven below the natural bed of the watercourse at a depth of not less than 15 cm or 10% of the height of the structure and its ends shall extend beyond the base of the embankment by not more than 30 cm and be adequately stabilized. Reference: *Regulation respecting standards of forest management for forests in the domain of the State*
NOR 06	Install a minimum of three observation wells in the selected locations around the stockpile to verify groundwater quality upstream and downstream. Reference: D019, section 2.3.2.1

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Soil, water, and sediment quality (cont.)	
NOR 07	Surround mining infrastructure pits so that drainage and runoff are transported to a basin and then treated as needed before being released into the environment. In addition, runoff outside activity areas shall be captured by drainage pits, built around the components of the mine site to prevent these waters from encountering sources of contamination (dilution prohibited). Reference: D019, section 2.1.5
NOR 08	Before discharging effluent water, ensure it will be done in accordance with the standards. Reference: *Metal and Diamond Mining Effluent Regulations*, sec. 4 and Schedule 4 and D019, section 2.1.1.1
NOR 09	In the event of an accidental spill, stop the leak as soon as it is spotted, contain the product and recover it using suitable equipment (absorbent sheets, flanges, drain covers, etc.). Immediately notify the Minister Excavate contaminated soil, place it in a sealed container and dispose of it in accordance with the hazardous materials management program. Advocate for quicker interventions to prevent deep infiltration. Reference: *Environment Quality Act*, Sec. 21 and *Regulation respecting hazardous materials*, Sec. 9
NOR 10	Set aside overburden and segregate the topsoil for reuse when redeveloping disturbed areas. Reference: D019, section 2.6
Atmosphere	
AIR 01	Regularly water roads, work areas, and stockpiles by moistening them to prevent resuspension and dust emission **and ensure that recordings of the application of water and dust suppressants is kept during construction and operation of the site. The frequency and intensity of watering the roads will thus be adapted to weather conditions and results from monitoring of air quality**.
AIR 02	Avoid unnecessary engine idling to reduce noise and disturbances from exhaust gas, smoke, dust, or any other contaminants likely to come from the machinery.
AIR 03	Limit the vehicle speed on the various sites as well as for mine operations.
AIR 04	Instead of burning, proceed as much as possible with chipping tree removal residue and clear brush at the work site and then spread.
AIR 05	Optimize stripping according to the real needs of the operation so as not to overexpose unused stripped surfaces in relation to wind erosion and/or to restrict, as needed, access to these surfaces if they are not used during long periods of time.
AIR 06	**Monitor total particulate matter (TPM), respirable particles (PM10), fine particles (PM2.5) and crystalline silica, especially near the truck road, from the start of operations.**
AIR 07	**Ensure regular maintenance of dust collectors in order to maintain a purification efficiency at all times.**
NOR 11	Ensure that vehicle and machinery exhaust systems are in good condition and function optimally to minimize contaminant emissions into the air, and ensure that the same is true for dust control systems for equipment and machines that are equipped. Reference: *Clean Air Regulation*, Sec.6

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Artificial light at night	
LUM 01	Restrict the emission of light toward the sky using fixtures that produce a simple and uniform lighting that would meet the real lighting needs with a luminous flux that would be directed toward the surface to be illuminated;
LUM 02	Limit the period and duration of the use of the lights at night.
LUM 03	Install fixed lights to avoid light spilling out of the spaces to be illuminated and pay attention to the orientation of portable lights and lighting from mobile sources.
Ambient noise	
SON 01	Ensure that motorized equipment (trucks, loaders, bulldozers, backhoes, etc.) are equipped with efficient silencers and are in good condition.
SON 02	**Inspect the machinery regularly to ensure that the exhaust systems are in good condition to limit noise emissions.**
SON 03	**Develop a mound with waste rock at the southern perimeter of the east WRTSF so as to have a screen effect between the mobile equipment circulating at the top of the stockpile and the truck stop at km 381. This mound will evolve according to the elevation of the stockpile.**
NOR 12	The reference noise level of a fixed source associated with a mining activity shall be assessed in accordance with the requirements of Instruction Note 98-01. Reference: D019, section 2.4.1
Vibrations and overpressure	
VIB 01	Notify all employees and the public about the blasting schedule.
VIB 02	For blasting activities, maintain a maximum of four holes exploding in 8 ms to ensure compliance with the vibration criteria of D019.
VIB 03	To limit overpressure, perform blasting activities in the absence of thermal inversion and carrier wind, when activities will be carried out within 800 m of the km 381 truck stop.
VIB 04	Use blasting mats and a collar height of at least 5 m when the blasting will be carried out within 500 m of the km 381 truck stop and the James Bay Road, to limit rock projections.
VIB 05	**Set up a vibration and noise self-monitoring system during blasting operations.**
NOR 13	Comply with the maximum distances and loads during blasting to adhere to the criteria of D019 and the threshold guidelines regarding the use of explosives in or near Canadian fisheries waters. Reference: D019, section 2.4.2 and Fisheries Act, para. 35(2) and Guidelines for the use of explosives in or near Canadian fisheries waters, p. 6, paragraphs 8 and 9.

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Vegetation and wetlands	
VEG 01	Carry out tree clearing to direct their fall into the areas to be cleared. Do not leave any logging residues in watercourses and areas not affected by the work.
VEG 02	Choose native plant species suitable for mine site rehabilitation and appropriate to the hardiness zone.
VEG 03	To prevent the introduction of invasive alien **plant** species **(IAPS)**, clean the excavation machinery or vessels before using them on site.
VEG 04	Recover tree species with commercial value, enrich other types of wood by chipping them and using them to condition soil.
VEG 05	Verify the potential introduction or not of invasive alien plant species annually **up to two years after completion of work and one year after restoration**, and quickly eradicate, wherever possible, any new occurrences of invasive alien plant species observed.
VEG 06	Make a clay berm all along the stripped areas to prevent the drainage of peatlands on the periphery of infrastructure.
VEG 07	Build a clay berm along the stripped areas to avoid drainage of the peat bogs on the periphery of the infrastructure.
NOR 14	Maintain a riparian protection area of 10 to 15 m, depending on the side slope, around wetlands, watercourses, and waterbodies. Reference: Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains, Sec. 3.1 and 3.2
NOR 15	Develop a compensation project for the loss of wetlands or water. Reference: *Act respecting compensation measures for the carrying out of projects affecting wetlands or bodies of water*, Sec. 2
Fauna	
FAU 01	Perform work in the water outside of the various reproduction periods of the species present, i.e., from July 1 to August 31 for brook trout, and from July 15 to April 15 for northern pike.
FAU 02	Prohibit or place maximum restrictions on deforestation activities between May 1 and August 15 to limit impacts on fauna during the main nesting periods.
FAU 03	Identify and report areas with the highest risk of collision with large mammals through adequate signage.
FAU 04	Prior to the demolishing a building or other facility, carry out an inspection (concealed spaces) to verify its possible use as maternity or dwelling place by bats. Where appropriate, protective measures will be taken to ensure the survival of bats.
FAU 05	Ensure workers are aware that it is important not to feed animals and not to leave food lying around so as not to attract wildlife near work areas.
FAU 06	**Establish deterrents in the event of birds using the water management ponds.**
FAU 07	**Limit the use of borrow pits as nesting sites for birds by softening the slopes and by using deterrents. If nesting does occur, create a no-go zone until nesting is complete.**

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Fauna (cont.)	
FAU 08	**Limit wildlife access to food waste by installing a composter and lids on garbage cans.**
NOR 16	Develop a compensation project for the loss of fish habitat. Reference: *Act respecting the conservation and development of wildlife*, Chapter IV.1; Lignes directrices pour la conservation des habitats fauniques; *Fisheries Act*, Sec. 35(2)b and *Metal and Diamond Mining Effluent Regulations*, Sec. 27.1 (if deposit of deleterious substances into fish habitat)
Use of land for traditional purposes	
UTT 01	Ensure workers are aware of traditional practices of Indigenous communities and activities of Indigenous users of the territory.
UTT 02	Establish and maintain a communication plan to inform the public, users, and municipal authorities about the start and progress of work.
UTT 03	Conduct beaver dam inspections at regular intervals to identify any changes to the CE2 water level and flow, and notify the community of these changes.
UTT 04	Prohibit hunting and recreational fishing by mine site workers, with a clause in the contract, and appropriate disciplinary measures.
UTT 05	**Provide a fund in the IBA with the Cree Nation of Eastmain to finance intergenerational knowledge transfer initiatives.**
UTT 06	**Encourage activities (such as stopping production to maintain machinery for around 10 days) that limit wildlife disturbance and road traffic during goose hunting season and facilitate breaks from traditional activities for Cree workers.**
Infrastructure	
CIR 01	Establish a traffic management plan, including **appropriate** signage **in specific areas, indicating speed limits and snowmobile and ATV crossings.**
CIR 02	Secure developments at risk **for land users by adding fencing**.
CIR 03	Maintain at all times public routes free of any obstruction of debris, waste, dirt, sediment, etc.
CIR 04	Establish, together with the Tallyman, an area closed to traditional activities for security purposes.
CIR 05	**Restrict machinery traffic to work areas.**
CIR 06	**Prohibit mine site access during a temporary cessation of mining activities.**
CIR 07	**Establish a protective berm around the pit to ensure the safety of land users during closure in accordance with the guidelines in section 4.5.2 of the Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec (2017).**

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Infrastructures (cont.)	
CIR 08	**Conduct appropriate training of truck drivers and confirm their licenses, qualifications and completion of applicable training programs. Train drivers assigned to the transport of hazardous materials on the transport of hazardous materials (TDG). Educate all drivers on the risks of using the Billy-Diamond highway, land use by Crees near the road, winter driving and night driving. The applicable number of transport hours must be respected. Conduct quarterly driver training and meetings to discuss driver safety, awareness and hot spots.**
CIR 09	**Install running recorders in the trucks.**
CIR 10	**Maintain a record of driver training files.**
CIR 11	**Perform routine inspections to check the condition of the vehicle before setting off. Trucks shall have adequate lighting, clean windows and mirrors, and be maintained to allow unobstructed vision. Inspections will be recorded.**
CIR 12	**Consider weather conditions before leaving or going to the project site.**
CIR 13	**Develop procedures for the proper management of truck breakdowns on the road.**
CIR 14	**Establish a radio communication protocol between the drivers, the site and the transshipment yard.**
CIR 15	**Monitor accidents along the road to see if there is a recurrence, validate and identify problems, if any, and propose corrective measures. Record all problems encountered on the road in the mine's global incident management log.**
CIR 16	**Avoid any animal intrusion into the container space for the management of WM (waste materials). The container itself will not allow access to animals and access to the container storage area will also be controlled by screens or fencing.**
Perception of physical environment	
PER 01	Post monitoring and follow-up reports on environment quality **annually on a dedicated website and present them to the tallymen if requested.**
Quality of life	
VIE 01	Establish an ongoing dialogue with the public through an internal community relations group and communication program.
VIE 02	Establish and implement a **Galaxy Lithium** Code of Ethics **and ensure that all workers are well informed of its contents.**
VIE 03	Prohibit alcohol **and drug** consumption in the worker camp at the site.
VIE 04	Offer healthy and balanced menus (low in sugar and trans fat) in the worker camp's cafeteria.
VIE 05	Establish with the representatives of the Cree community an annual calendar of the main traditional activities and set time slots for production stoppages based on their participation in these activities. **Grant leave requests during traditional business periods.**

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Quality of life (cont.)	
VIE 06	Prohibit all forms of video lottery and **gambling** at the site.
VIE 07	**In collaboration with the Cree liaison officer and the CBHSSJB, implementation by the Galaxy's human resources department of a social issue awareness program for workers, including sexual harassment, prostitution, alcohol and drug use, gambling, money management, violence and any other issue that may arise during mine operation.**
VIE 08	**Offer suitable working conditions for pregnant women by complying with the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) program "For a Safe Maternity Experience".**
VIE 09	**Provide STBBI testing services to workers and their families, in collaboration with the CBHSSJB.**
VIE 10	**Ensure that telephone and/or Internet services are available at the camp to encourage workers to contact their families.**
VIE 11	**Authorize family visits for workers staying on the mining site during special occasions.**
VIE 12	**Have zero tolerance for violence on employee housing and work sites, and enforce disciplinary measures if someone is found guilty of violence or harassment.**
VIE 13	**Reserve a section of the workers' camp for women to protect their privacy.**
VIE 14	**Have at least one woman present at the camp on Galaxy's human resources team to facilitate discussions with Cree and non-Cree female workers.**
VIE 15	**Set up a system for receiving and processing complaints before construction begins and until closure. A report on the nature of complaints received by Galaxy, and the manner in which they were dealt with, will be presented to the members of the monitoring committee at each meeting.**
VIE 16	**Maintain good relations between Galaxy and Cree First Nations.**
VIE 17	**Prevent food and material waste at the mine and offer the surplus, if any, to Cree aid groups through the Environment Committee.**
VIE 18	**At the request of and in collaboration with the Council of the Eastmain Nation, a ceremony of gratitude for Mother Nature will be held at the future mine site before construction begins.**
VIE 19	**According to the rules of the Km 381 truck stop and Galaxy policies, zero tolerance of prostitution, and request police intervention if a case is reported.**
VIE 20	**Galaxy's human resources department records cases involving calls to police on the files of Galaxy employees and subcontractors.**
VIE 21	**Inclusion of terms and conditions regarding hours and benefits of Cree workers in the Impact and Benefit Agreement (IBA) with the Cree Nation of Eastmain.**
VIE 22	**Formation of a follow-up committee, which will include representatives of the Eastmain and Waskaganish Cree Nations, the James Bay Eeyou Istchee Regional Government, and the tallymen of traplines RE1, RE2, RE3, VC33, VC35 and R08. Tallymen who own traplines north of the Eastmain River will be invited to sit on the monitoring committee and on other committees, if they deem it appropriate.**

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Local and Regional Economy	
ELR 01	Establish a regional purchasing policy that would prioritize local and regional companies in the competitive bidding process where the skill and price are competitive.
ELR 02	Offer training programs **to local workers when possible**, to fill mine positions. **Organize training in partnership with DCHR to give Cree Nation workers access to jobs at the mine.**
ELR 03	**Prioritize the Cree workforce, followed by the regional workforce, with equal skills, for the available positions.**
ELR 04	Develop a memorandum of understanding and partnership agreement for Indigenous participation in the project (agreement on repercussions and benefits).
ELR 05	Implement mechanisms to integrate workers, particularly for members of Indigenous communities (information sessions, human resources representatives, employee assistance program, etc.).
ELR 06	**A communication committee and the Galaxy human resources department will communicate with local stakeholders and go to schools to present the positions available at the mine.**
ELR 07	Regularly update forecasts regarding the duration of operations and announce in advance the closure of the mine.
ELR 08	Develop an Employee Assistance Program to provide closure transition support (e.g. reclassification assistance committee for workers).
ELR 09	**Participate in a committee to maximize economic benefits (COMAX).**
ELR 10	**Work with the Council of the Cree Nation of Eastmain to ensure the greatest number of Cree recruits.**
ELR 11	**Train recruiters and managers to recognize stereotypes and cognitive biases related to the type of work women can do, especially in non-traditional roles.**
ELR 12	**Adopt a meritocratic hiring process, from the resume review and selection phase to final offers.**
ELR 13	**Be flexible in the time and place of training offered for accessing employment, when possible.**
ELR 14	**Provide development assistance for women focused on specific skills, such as influencing and networking. Provide specialized on-site training and development sessions. Provide networking opportunities for women to exchange information and support each other.**
ELR 15	**Offer jobs in the community of Eastmain in addition to those at the mine, so that women can be close to their families.**
ELR 16	**Submit to the MELCC a detailed program for monitoring the impacts on the human environment, which will include monitoring the impact on training, employment and the economy of regional communities.**
ELR 17	**Encourage training and employment among young people by giving presentations in the region's schools (high schools and CEGEPs), in collaboration with the schools and school boards concerned. Galaxy will inform students of all employment opportunities in the mining sector that result from graduation. To do this, posters presenting job opportunities at the Galaxy mine will be hung in schools and public buildings, and career days will be held that involve different types of mining workers. Guided tours of the mine will also be offered to local students.**

Table 7-5 List of applicable mitigation measures (cont.)

Code	Description
Local and Regional Economy (cont.)	
ELR 18	**Hiring of a liaison officer from the Cree Nation of Eastmain during all project phases. Their role will be to inform the Cree population of the jobs and contracts offered by the company, to ensure Cree workers are successfully integrated with other mine site workers, to share the concerns of the Cree population with the company, including land users, and to help find solutions for conflicts.**
Heritage and Archaeology	
ARC 01	Ensure workers are aware of the obligations regarding fortuitous archaeological discoveries.
ARC 02	**Communicate with the tallyman of trapline RE2, the Council of the Eastmain Nation, and the Culture and Language Department of the Cree Nation Government in the event that an artifact is discovered.**
NOR 17	Report to the officials of the various building sites any fortuitous discovery and halt work at the location of the discovery until it can be fully assessed. Officials must notify the Minister of it without delay. Obtain formal authorization from these officials before resuming work. Reference: *Cultural Heritage Act*, Sec. 74
NOR 18	Have a professional assess any archaeological sites discovered to determine the extent of work required (e.g., excavation) to protect archaeological discoveries. Reference: *Cultural Heritage Act*, Sec. 76
NOR 19	Obtain an archaeological research permit to conduct any excavations or surveys of the property or archaeological sites. Reference: *Cultural Heritage Act*, Sec. 68
Landscape	
PAY 01	Shape the top of waste rock stockpiles to round and integrate them into the landscape.

7.2 IMPACTS ON THE PHYSICAL ENVIRONMENT

7.2.1 SOILS

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Hazardous and waste materials management.

MITIGATION MEASURES

Mitigation measures SUR 01 to SUR 04, QUA 01 to QUA 04, QUA 08 to QUA 13 should be applied, as well as standards NOR 02 to NOR 04, and NOR 09 described in Table 7-5.

DESCRIPTION OF IMPACT

In the site preparation stage, erosion occurs during deforestation, grubbing, grading, development, fill/excavated material operations, as well as during the construction of watercourse crossing structures. Soil erosion and sediment transport are greatly influenced by soil conditions, slope, and precipitation patterns.

The environmental site assessments (phases I and II ESA) (WSP, 2018a and 2018b) revealed that residual materials (paper, plastic, metal, wood, fabric) were observed at the remote landfill. However, the remote landfill sector is located outside planned works and in this sense, the risks of soil contamination by contact with the remote landfill soils are unlikely or non-existent.

Risks of soil contamination are also possible, mainly because of the potential leak of petroleum products or accidental spills from equipment. The impact of a potential spill would be, among other things, based on the volume of contaminants spilled, the uniqueness (spill) or the repetition (leak) of the problem. In the event of a spill, the actions provided for in the emergency action plan will be implemented quickly, which will help to limit the extent of the contamination. These measures focus on prevention by regularly checking equipment and adding emergency devices that will allow for a quick response in case of an accident. In addition, in the event of a spill, the emergency plan will be quickly implemented, which will reduce the extent of contamination and prevent the contamination of groundwater. Losses or spills of hydrocarbons or other products are generally one-time events and accidental.

Moreover, environmental surveillance activities are especially important in the prevention and effectiveness response in case of a spill, and some preventative measures will also reduce the risk of major spills, like the implementation of double-walled tanks.

IMPACT ASSESSMENT

For all the reasons mentioned above, the intensity of this impact is considered low since soil quality is not likely to change. The extent is considered local given that soil contamination or erosion would occur in an area confined to the incident site or areas of the site in operation. The duration is short since it will be possible to immediately respond to decontaminate the site quickly or dispose of contaminated soil in a short time. For soil erosion, its duration is also short because it may occur during the entire construction period. The extent of the impact on the soil during the construction phase is considered **minor**.

OPERATION PHASE

SOURCES OF IMPACT

— Management of economic material, unconsolidated deposits, and waste rock.
— Hazardous and waste materials management.

MITIGATION MEASURES

Mitigation measures SUR 01 and SUR 02, QUA 01 to QUA 05, QUA 10, QUA 12 should be applied, as well as standards NOR 02 to NOR 04, NOR 09 and NOR 10 described in Table 7-5.

DESCRIPTION OF IMPACT

The risks of soil contamination in case of accidental spills are the same as during the construction phase. In addition, since the hydrocarbon tanks will be above ground, the risk of a leak going unnoticed for a relatively long time is unlikely. Also, as with the construction phase, environmental monitoring activities will prevent the anticipated impacts.

IMPACT ASSESSMENT

The application of mitigation measures will minimize the potential impacts on the soil during the operation phase. Overall, the intensity of this impact is considered low. Its extent is local since sediment erosion and transport may occur at any mine site. The duration is medium since the impact may occur during the life of the mine, a period of approximately **18** years. Overall, the significance of the impact on the soils during the operation phase is considered **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

— Infrastructure dismantling.
— Hazardous and waste materials management.

MITIGATION MEASURES

In the rehabilitation phase, mitigation measures SUR 02, QUA 01 to QUA 04, QUA 07, QUA 08, QUA 12 and standards NOR 01 to NOR 04 and NOR 10 in Table 7-5 must be met.

DESCRIPTION OF IMPACT

Overall, the impact of activities during the rehabilitation phase will be approximately the same as that of the construction phase, until the site is completely restored.

As the rehabilitation materializes, hazardous materials not required will be removed from the site, recovered and returned to suppliers, sold to a third-party or disposed of by firms authorized to manage these materials. The aboveground tanks will be removed from the site and the soils beneath these will be characterized. In case of contamination, they will be handled in accordance with the laws and regulations in force. The footprints of the rock storage area and those supporting the infrastructure will be characterized, and if the soil meets the quality criteria, they will be left in place. If not, they will be excavated and handled in situ or even transported to an authorized contaminated soil treatment site.

The dismantling of infrastructures can also contribute to soil erosion (scarification of roads, dike retreat, etc.).

Finally, to avoid leaving an environmental legacy behind, the rehabilitation plan provides that the entire site will be characterized to determine whether the soil is contaminated, as per the criteria set by the **MELCC**. If so, it will be handled in accordance with the laws and regulations in force.

IMPACT ASSESSMENT

The application of mitigation measures will minimize the potential impacts on soil contamination and erosion. As a result, the intensity of the contamination phenomena is considered low. Its extent is local and could occur throughout the mine site. The duration will be short since the impact will only be felt during the closure phase. The significance of the impact on the soil during the rehabilitation phase is considered **minor**.

POST-REHABILITATION PHASE

Only waste rocks and tailings in the stockpiles will be left on the site after its rehabilitation. As mentioned in Section 4.7, the results of the kinetic tests conducted on these materials show that they are considered low risk in accordance with D019 and non-potentially acid generating. Consequently, acid or contaminated mine drainage following the site rehabilitation is not anticipated.

A site environmental characterization will be conducted at the closure of work. Samples will be collected and analyzes will be conducted. A contaminated soil management plan will be established if soil contaminated beyond applicable criteria or background levels if higher than the criteria "A" in the Guide d'intervention (MELCC) is identified during the characterization.

Soil that does not comply with the applicable criteria will be excavated and managed in accordance with its level of contamination which depends on the applicable regulations. Samples will be collected from the excavation walls and bottoms as to confirm soil left in place comply with the applicable criteria.

Once the site has been restored, the impacts will be non-existent, since no mining activity likely to alter the soil quality will be taking place.

7.2.2 HYDROGEOLOGY

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Water management.

MITIGATION MEASURES

Standard mitigation measures SUR 01 and SUR 02 will be applied to reduce the project's impact on hydrogeology. These mitigation measures consist mainly in minimizing the increase in runoff, as this change may affect the seepage rate and, to a lesser degree, the local flow regime. The following measures will also be applied: QUA 01 to QUA 04, QUA 10 to **QUA 13**.

DESCRIPTION OF IMPACT

During soil excavation to develop or install various infrastructure, the surface water seepage regime will be altered. It may be limited or higher depending on the type of development. Also, if the groundwater body is reached during excavation, the water will have to be pumped out, thereby altering groundwater flow locally.

IMPACT ASSESSMENT

During the construction phase, the intensity of the impact is deemed low given that minor changes to the flow regime will be noted. The mitigation measures to be applied will reduce the anticipated impacts. The extent is limited since the impacts will be felt near the work areas. The duration will be short because groundwater flow will rebalance once the work is completed. In short, the significance of the residual impact on the groundwater flow regime will be **minor**.

OPERATION PHASE

SOURCES OF IMPACT

During the operation phase, activities likely to affect the groundwater flow regime are essentially the following:

— Presence and operation of the pit;
— Other infrastructure in operation;
— Management of economic material, overburden and waste rock; and
— Water management.

MITIGATION MEASURES

The QUA 06 measure will be applied to monitor anticipated changes in the local flow regime, and the drawdown and rise of the water table. **QUA-14 will be applied as a monitoring measure to determine the quantity and quality of water in the truck stop drinking water supply well.** In addition, NOR 06 provides that a network of monitoring wells will be established on the periphery of the mining infrastructure.

DESCRIPTION OF IMPACT

Pumping activities required for pit dewatering will lead to changes in the groundwater flow regime, particularly near the pit, and may alter the recharge and resurgence rates in some watercourses near the site. During the various operation phases, the groundwater level in the pit will be maintained through pumping near the bottom of the pit. The groundwater piezometric surface will therefore be gradually lowered to allow for dry operations.

A lowering of the water table in the bedrock and in unconsolidated deposits will therefore be observed around the pit. The effects of dewatering activities on the groundwater flow regime are controlled by hydrogeological features, that is, the hydraulic properties of geological formations, and the link between them and the surface water system. These features are particularly complex in hydrogeological systems with fissured rock environments, like those found on the site. That is why digital modelling is customary in such cases to represent the hydrogeological system and assess the potential impacts of dewatering activities.

Hydrogeological modelling was conducted to assess the impact of pit operation on the surrounding environment (water table drawdown) and to estimate the volume of water pumped when the pit is in the final operation stage. According to the modelling results, the anticipated groundwater drawdown will be at a maximum near the pit, decreasing as the distance from the pit increases.

Appendix J of the sectoral study (**WSP, 2021a**) provides details of the modelling work. The results indicate that the dewatering flows at the end of operation would be 1,700 m^3/day. When operation wraps up, the water table drawdown is expected to be virtually nil at approximately **2 km east of the pit (Map 7-1). For the south and west sectors, the drawdown would be almost nil at a distance of 500 to 900 m from the pit walls. In the northwest sector, the retention basin will create a slight local increase in the groundwater level of about 0.5 m (negative drawdown on Map 7-1).**

The only groundwater user listed in the sector is located approximately 700 m from the pit boundary (potable water wells at the km 381 truck stop), that is, within the edge of the potential water table drawdown area. **The estimated water level drawdown in the sector is less than 2 m.** The impact on the wells should therefore be negligible. In addition, the water table drawdown area will be developed gradually as the pit develops. There will therefore be enough time to gather geotechnical and piezometric data with a monitoring system in place, which will make it possible to foresee potential problems and take corrective action where necessary.

The results also show that the impact on lakes and watercourses would involve reduced **base flow between 1 and 64%, meaning a decrease in average flow between 0 and 2%**. Groundwater contribution to the base flow of watercourse CE4 would become very low.

Lake Kapisikama, located less than 200 m from the pit, will be impacted and will no longer be supplied by groundwater **as of year 4**. The four-fold reduction in the surface area of the watershed of this lake will also decrease surface water inflow. The lack of groundwater contribution and the reduced surface water inflow will cause the lake's water level to drop.

The stockpiles will not affect groundwater flow. A permeable drainage layer at the base of the stockpiles will drain water towards the ditches. In the area of the stockpiles north of creek CE3, the ditches will result in a slight drawdown of the water level. Only the overburden stockpile and retention basin will result in a slight increase in water level (see Map 7-1). The percolation flows under all stockpiles were calculated to ensure that they comply with the D019 standards. All stockpiles have percolation flows below the 3.3 l/m²/d criterion with a maximum of 0.15 l/m²/d.

IMPACT ASSESSMENT

During the operation phase, changes in the flow regime are related to pit operation. The intensity is deemed moderate given that a significant water table drawdown is planned around the pit. The extent of the impact is deemed local because the changes to the groundwater flow regime will occur within a radius of up to 1.7 km around the pit. The duration of the impact will be long because the flow regime will be altered throughout the operation phase. In short, the significance of the residual impact on hydrogeology is deemed **moderate**.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling
- Pit rehabilitation.
- Water management.

MITIGATION MEASURES

No additional mitigation measures are planned during the rehabilitation phase other than monitoring of the drawdown and rise of the water table (QUA 06). A network of wells established on the periphery of the mining infrastructure will be kept and studied after operations end.

DESCRIPTION OF IMPACT

Stopping pit dewatering activities at the end of the project will cause the groundwater level to rise back to its initial position. The final rise in the groundwater level will depend on the conditions of equilibrium for the formation of a lake inside the pit. The groundwater flow regime is expected to essentially return to its original state once the pit is filled, except in the south portion of the pit where the lake level will be below the currently measured groundwater level.

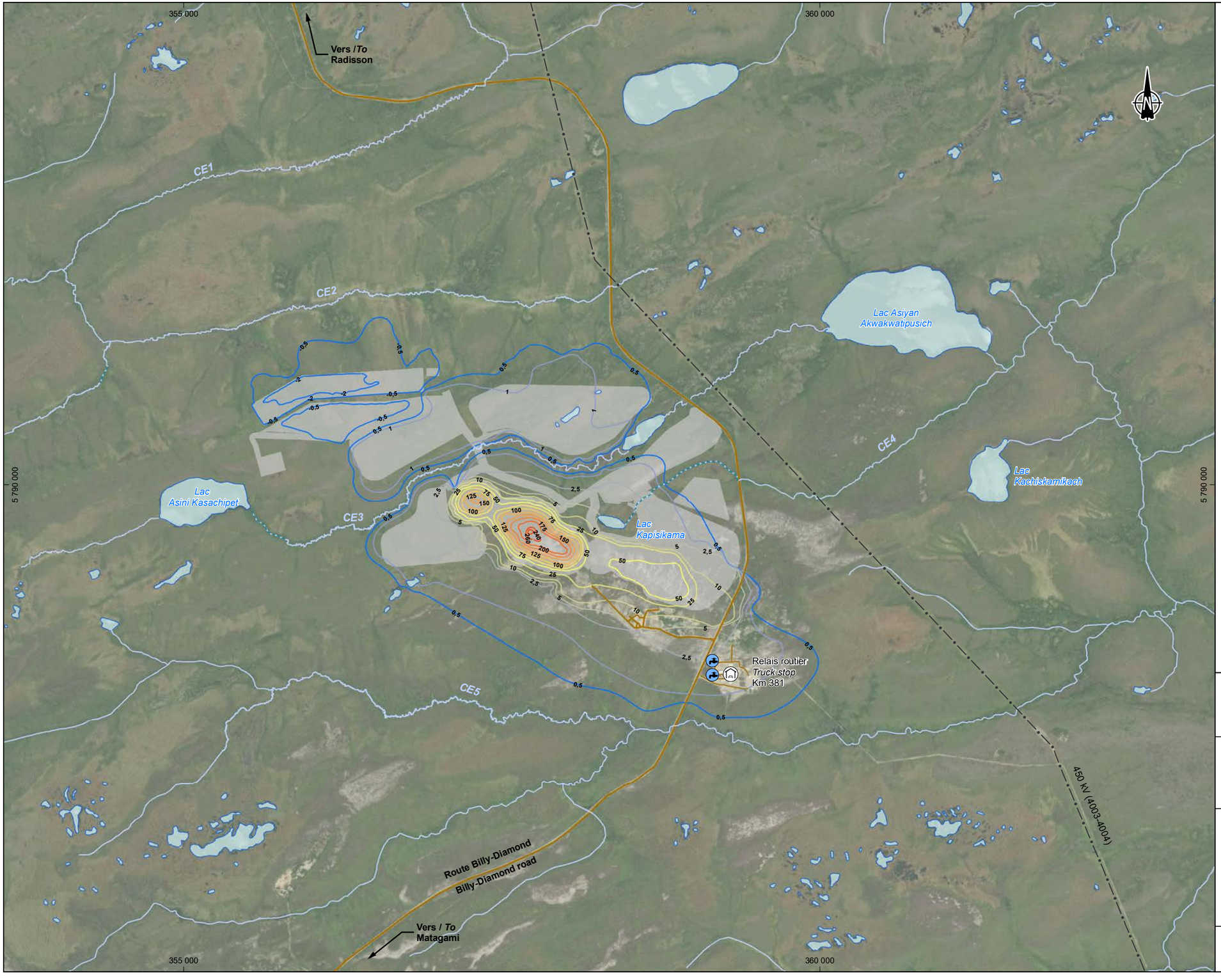
The impacts noted during the operation phase are similar for the rehabilitation phase as concerns the waste rock stockpile. The piezometric level will begin to recover as soon as mining operations end. In the post-operation phase, waste rock stockpiles will drain slowly under the effects of gravity to reach a new permanent equilibrium. The length of the recovery period will depend on hydrogeological conditions.

IMPACT ASSESSMENT

During the rehabilitation phase, the intensity is considered moderate because groundwater will continue to accumulate in the pit. The extent is deemed local because the effect will be felt within a radius of up to 1.7 km around the pit. Its duration is estimated to be long because it will take a number of years for the rock formation to return to a state of equilibrium. In short, based on the assessed impacts, the significance of the impact on hydrogeology is deemed **moderate**.

POST-REHABILITATION PHASE

Stopping pumping activities will have a positive effect on hydrogeology in the post-rehabilitation phase, allowing a new natural equilibrium to be gradually reached in the environment. The pit is expected **to fill up in 120 to 180 years**.



Composantes du projet (2021) / *Project Component (2021)*

Empreinte de la mine / *Mine footprint*

Rabattement / *Drawdown*

- 0,5 m (Faible / *Low*)
- 1 m
- 2,5 m
- 5 m
- 10 m
- 25 m
- 50 m
- 75 m
- 100 m
- 125 m
- 150 m
- 175 m
- 200 m
- 240 m (Élevé / *High*)

Infrastructures / *Infrastructure*

- Route principale / *Main road*
- Route d'accès / *Access road*
- Ligne de transport d'énergie / *Transmission line*
- Relais routier / *Truck stop*
- Source d'eau potable / *Drinking water source*

Hydrographie / *Hydrography*

- CE3 — Numéro de cours d'eau / *Stream number*
- Cours d'eau permanent / *Permanent stream*
- Cours d'eau à écoulement diffus ou intermittent / *Intermittent or diffused flow stream*

GALAXY

Mine de lithium Baie-James /James Bay Lithium Mine

Mise à jour de l'étude d'impact sur l'environnement

Carte / *Map* 7-1
Rabattement du niveau d'eau, dénoyage final /
Water level drawdown, final dewatering

Sources :
Orthoimage : World Imagery (ESRI, 2018)
Rabattement / Drawdown, WSP 2021

0 300 600 m
UTM, fuseau 18, NAD83

Dessin : A. Lemay
Approbation : S.Bottier
201-12362-00_c7-1_wspT325_rabat_210630.mxd

wsp

7.2.3 HYDROLOGICAL REGIME

CONSTRUCTION PHASE

SOURCES OF IMPACT

— Site preparation and infrastructure construction.
— Water management.

MITIGATION MEASURES

Mitigation measures SUR 01, SUR 03, SUR 04, QUA 07, QUA 09 and QUA 11 will have to be applied in order to limit the impact on the hydrological regime in the study area during the construction phase, along with standards NOR 01, NOR 05, NOR 07, NOR 14 and NOR 15, described in Table 7-5.

DESCRIPTION OF IMPACT

The development of surfaces (deforestation, excavation, topsoil stripping, backfilling, grading of surfaces, etc.) for the construction of various mining facilities and infrastructure, and the construction of drainage ditches and watercourse crossing structures will likely alter the natural flow of surface water locally. Moreover, soil compaction could limit water seepage into the soil, thus promoting increased surface runoff.

Kapisikama Lake will supply the water for the operation of the temporary concrete plant during the construction phase. The withdrawal of water could result in a decrease in the lake's water level. However, the operation period will dewater the lake as a result of pit dewatering. The potential change in water level in the headwater lake feeding an intermittent watercourse will have a much smaller impact than the dewatering during the operation phase. The description of the drawdown of the water table leading to dewatering of the lake from Year 4 onwards is presented in Section 7.2.2, while the following section discusses the impact on the hydrological network during the operation phase.

IMPACT ASSESSMENT

Since small areas relative to the total watershed surface (approximately 5%) will be affected by the construction work, and considering the planned mitigation measures, only minor changes to the hydrological regime are anticipated. The intensity of the impact is therefore considered low. It will be limited in scope since it will be in a small area where construction will take place, and its duration will be short since it will be limited to the construction phase. The significance of the impact on the hydrological regime during the construction phase is therefore **minor**.

OPERATION PHASE

SOURCES OF IMPACT

— Presence and operation of the pit.
— Other infrastructure in operation.
— Management of economic material, overburden and waste rock.
— Water management.

MITIGATION MEASURES

Mitigation measures SUR 01, QUA 05 and UTT 03 will have to be applied to limit the impact on the hydrological regime in the study area during the operation phase, along with standards NOR 01, NOR 05, NOR 07, NOR 08 and NOR 14, described in Table 7-5.

DESCRIPTION OF IMPACT

During the operation phase, all contact water on the mining site will be collected by a network of ditches and pumping stations, directed to a retention basin and then pumped out into effluent located on creek CE2 after passing through the WTP**, as required**. Map 7-2 shows the location of proposed infrastructure as well as the delineation of watersheds in the study area under the projected conditions, while Table 7-6 shows the project's impact on the areas of the watersheds under study.

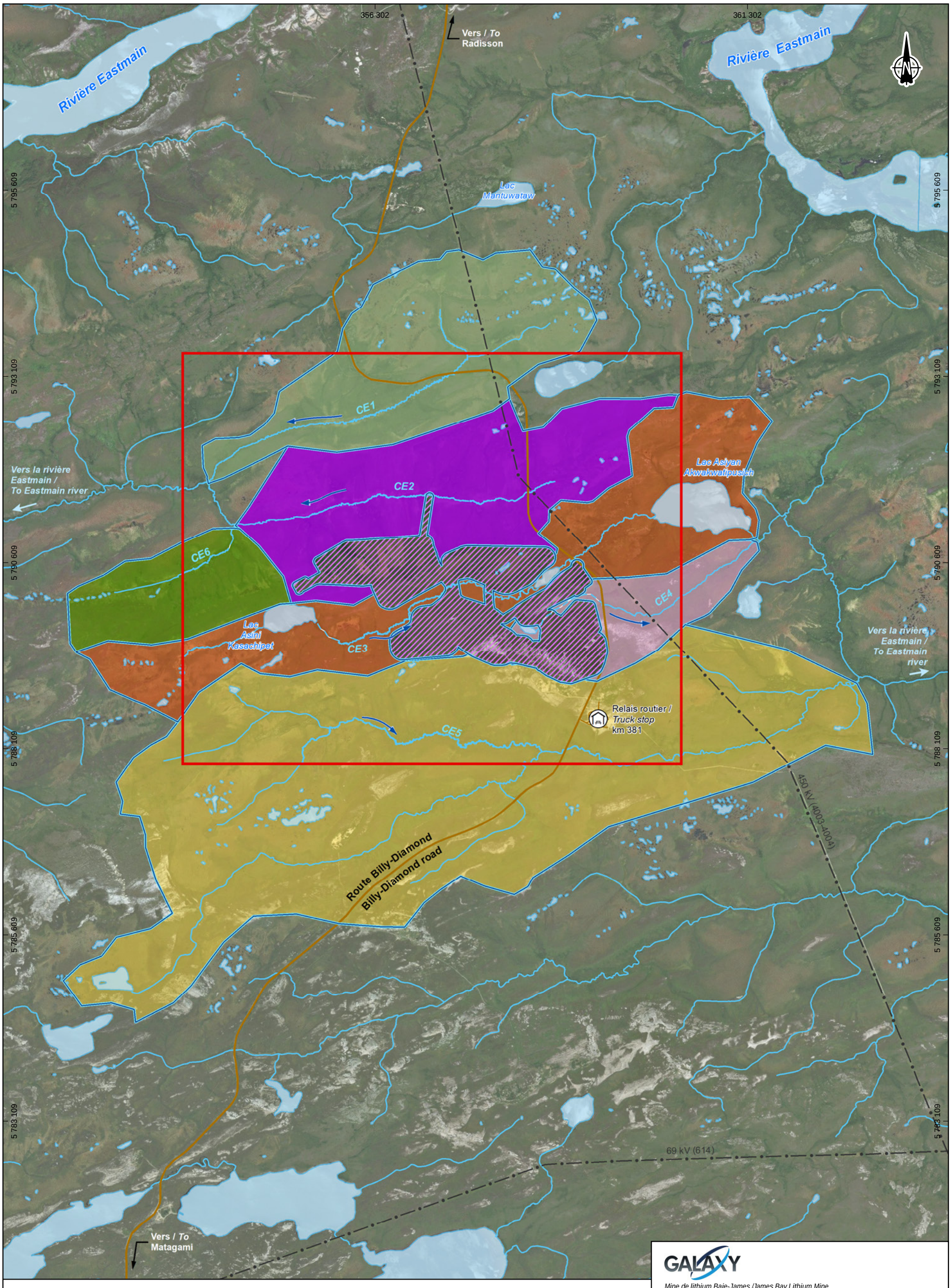
Impacts on the watersheds

The watersheds of creeks CE1 **and CE6 are unaffected** by the project. Considering natural runoff only, the watershed of creek CE2 is **16**% smaller; however, since it will be receiving the main mining effluent, its total surface area will increase by **340**%. The watersheds of creeks CE3, CE4 and CE5 will be **encroached upon by project infrastructure**, which will reduce their surface areas by **18**%, **33**% and 1%, respectively. **We can also note that for the mine effluent in creek CE2, the natural watershed at the projected conditions is 4.1 km².**

A comparison with points located further downstream of the watercourses reveals that the impacts are mitigated because the surface area of the northern part (at the junction of CE1, CE2 and CE6) is increased by **16**%, whereas the tributary surface area of the southern part (**at the junction of** CE3, CE4 and CE5) is reduced by **6**%.

Table 7-6 Impact of the project on watersheds in the study area

Body of water	Size (km²)		Difference (%)
	Current state	Future state	
Northern part	**19.81**	**22.88**	**+16**
CE1	7.63	7.63	0
CE2	9.07	**12.14**	**+34**
• Natural – outside project footprint	9.07	**7.64**	**-16**
• Project infrastructure	-	**4.50**	**-**
CE6	3.11	**3.11**	**0**
Southern part	**48.76**	**45.70**	**-6**
CE3	10.33	**8.49**	**-18**
CE4	3.03	**2.02**	**-33**
CE5	27.01	**26.79**	-1



Zone d'étude locale / *Local study area*

Hydrographie / *Hydrography*

Limite de bassin versant / *Watershed limit*

Bassin versant 1 / *Watershed 1*

Bassin versant 2 / *Watershed 2*

Ruissellement sur le site vers l'effluent CE2 / *Site runoff to CE2 effluent*

Bassin versant 3 / *Watershed 3*

Bassin versant 4 / *Watershed 4*

Bassin versant 5 / *Watershed 5*

Bassin versant 6 / *Watershed 6*

Cours d'eau permanent / *Permanent stream*

Cours d'eau à écoulement diffus ou intermittent / *Intermittent or diffused flow stream*

CE3 — Numéro du cours d'eau / *Stream number*

Sens d'écoulement de l'eau / *Direction of water flow*

Effluent minier / *Mine effluent*

Infrastructures / Infrastructure

Route principale / *Main road*

Route d'accès / *Access road*

Ligne de transport d'énergie / *Transmission line*

Relais routier / *Truck stop*

GALAXY

Mine de lithium Baie-James /James Bay Lithium Mine

Carte / *Map* 7-2
Bassins versants aux conditions projetées / *Future Watershed Limits*

Sources :
Image, Bing Maps Aerial
Inventaire / Inventory, WSP 2021
Données du projet / Project data : Galaxy 2021

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UTM, fuseau 18, NAD83

Juin 2021

Dessin : A. Masson
Approbation : E.Sormain
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Impact on the flows and levels

Typical flows under future conditions were estimated using the same methodology as the one for flows under current conditions, described in the hydrological technical study *(Étude spécialisée sur l'hydrologie*) (WSP, 2018*b*). Additions to these natural flows include the expected effluent discharge rate into creek CE2 and the influence of the water table drawdown through pumping around the pit. It should be noted that due to the very flat and marshy (peat bog) nature of the watersheds studied, uncertainty remains about the evaluation of typical flows and impacts on them. The values should therefore be considered with caution. No water extraction from the watercourses will occur for the purposes of the project during the operation phase.

Table 7-7 shows the average effluent discharge volumes in the operation phase (year 9) under average conditions (considering the effects of climate change) as well as under dry conditions (Golder, 2021).

Table 7-7 Average monthly effluent flows

Month	Average conditions with climate change (year 9) (m^3)	Dry conditions (1 :25 years) (m^3)	Wet conditions (1 :25 years) (m^3)
January	158,920	148,060	157,560
February	152,150	143,710	150,540
March	152,650	145,010	152,630
April	159,470	149,940	160,610
May	0	0	0
June	0	0	94,620
July	284,130	11,700	331,330
August	236,120	167,190	270,140
September	338,700	236,100	381,640
October	348,270	242,800	392,470
November	78,790	53,340	85,930
December	173,780	157,580	172,970

Source: Golder, 2021.

According to the findings of the hydrogeological study (WSP, **2021a**), dewatering the pit will have a small impact and low-water flows in the upstream portion of creeks CE3 **and** CE4 and to a lesser extent in creek**s** CE2 **and CE5** (section 7.2.2). Creek CE1, further from the pit, should not be impacted.

Table 7-8 shows an estimate of the impacts on the typical flows of watercourses in the study area. For creek CE2, substantial increases are anticipated in summer low flows (**an increase of 3 to 8 times their approximate values**) and in average flows during nearly all months (**up to 80% in winter and approximately 50% in fall**) due to the presence of mining effluent. In contrast, average monthly flows **in the beginning of summer (May and June)** decrease by approximately **16% since no effluent discharge flow is expected**. Flood flows are slightly higher for the weakest recurrences (**+9%** for the 2-year flood), but slightly lower for the strongest (**-5%** for the 100-year flood) **as a result of the reduction from the on-site water management system**.

In the southern part, all typical flows are expected to decrease in all watercourses. For CE3, the decrease is **37**% for low-water flows, **20**% for average flows and **22**% for flood flows. For CE4, affected by pit dewatering, the decrease is more than **97**% for low-water flows, **35**% for average flows and **35**% for flood flows. Lastly, only a slight decrease of 1 to **3**% in typical flows is expected for CE5. Although the percentage change may seem very large, given the order of magnitude of the flows involved (approximately 0.01 m^3/s to 0.3 m^3/s), the values are nonetheless low.

The impact on water levels in creeks CE2, CE3 and CE4 was assessed using one-dimensional hydraulic modelling with HCE-RAS software. The methodology used to build and calibrate the model, and to run the simulations, is detailed in the specialized study on hydrology (WSP, **2018c**), which also contains a map of the model domain.

It should be noted that since the local watercourse slope is very gentle and the floodplain is closely connected to the low-flow channel, a change in flow entails a very small water level change in these watercourses. It therefore appears that, due to the presence of natural log jams or beaver dams, the control sections are the main factor influencing water levels in the study area, which limits the project's impacts on those levels. The simulations that were run represent the current state of the watercourse as surveyed in 2017 and 2018. However, these conditions could change if the controls move, disappear or are altered.

Table 7-8 shows the project's impacts on the water levels of watercourses in the study area. For creek CE2, no significant impact is expected upstream of the mining effluent discharge point. Downstream, water levels are expected to rise 3 to 13 cm during summer **and winter** low flow due to the presence of effluent. The average monthly flows are slightly higher **from December to April, with a maximum of 10 cm increase in the effluent level in March. The impact is lower from May to November, with expected variations from -2 cm to +2 cm.** Flood levels are higher for the weakest recurrences (+3 cm to **approximately** +8 cm for the 2-year flood) and less so when the recurrence increases, even decreasing slightly for the 100-year flood downstream of the watercourse. For creek CE3, the simulations that were run show negligible impacts downstream of the mining effluent. Upstream of this point, a slight decrease in water levels is expected: 1 cm **to 3 cm** for low-water **and average levels and up to** 7 cm for 100-year flood levels. For creek CE4, the impact was assessed solely downstream of James Bay road, with an observed decrease of 2 to 9 cm in all typical levels. **During low-water periods, the decrease in flow is such that it is expected that there will be no flow, but simply water basins, the level of which level is maintained by the hydraulic controls present on the watercourse.**

Table 7-8 Impact of the project on typical flows of watercourses in the study area

		Impacts (%)							
		CE1	CE2	CE6	Northern part	CE3	CE4	CE5	Southern part
Low-water flows	$Q_{2,7}$ annual	0%	+345%	0%	+158%	-37 %	-97 %	-3 %	-15 %
	$Q_{10,7}$ annual		+720%		+330%				
	$Q_{5,30}$ annual		+526%		+241%				
	$Q_{2,7}$ summer		+153%		+70%				
	$Q_{10,7}$ summer		+368%		+168%				
	$Q_{5,30}$ summer		+163%		+75%				
Average monthly flows	January	0%	+54%	0%	+25%	-20 %	-35 %	-1 %	-7 %
	February		+80%		+37%				
	March		+87%		+40%				
	April		+78%		+36%				
	May		-16%		-7%				
	June		-16%		-7%				
	July		+37%		+17%				
	August		+27%		+12%				
	September		+49%		+22%				
	October		+40%		+18%				
	November		-1%		0%				
	December		+32%		+15%				
	Annual		+23%		+11%				
Flood flows	2 years	0%	+9%	0%	+4%	-22 %	-35 %	-1 %	-11 %
	10 years		0%		0%				
	25 years		-3%		-1%				
	50 years		-4%		-2%				
	100 years		-5%		-2%				

Given the increases in flow expected in creek CE2, attention was paid to the impact on velocities in the low-flow channel. In some sections, we note a slight reduction in velocities due to the local effects of controls. However, we see an increase in velocities in the creek overall. Consequently, for a two-year flood, there is an estimated increase in the range of **50**% immediately upstream from the effluent (from 0.04 m/s to 0.0**6** m/s), to 25% at the level of the junction with CE6 (from 0.12 m/s to 0.15 m/s). For the 100-year flood, the increase is more limited, ranging from **11**% at the level of the effluent (from 0.09 to 0.10 m/s) to 12% at the level of CE6 (from 0.17 to 0.**19** m/s). **Concerning the average monthly flows,** the **maximum** increase **observed in March** is in the range of **100**% (from 0.03 m/s to 0.0**6** m/s). Nonetheless, it should be noted that, despite this high-percentage increase, the order of magnitude of velocities remains very low, never exceeding 0.4 m/s for each scenario simulated – which is explained by the very gentle slope of the watercourse and the large flood plains connected to the low-flow channel. The increase in velocities therefore should not cause erosion in the watercourse, nor any major morphological changes.

Table 7-9 Impact of the project on watercourse levels in the study area

Simulated conditions		Northern part CE2	Southern part CE3	Southern part CE4
Low-water flows		from +3 cm to +13 cm, depending on the sections	from -1 cm to -3 cm, depending on the sections	water basins maintained by the existing hydraulic controls but no flow
Average monthly flows	May to November	from -2 cm to+2 cm maximum of -3 cm in May/June	from -1 cm to -3 cm, depending on the sections	from -8 cm upstream to -3 cm downstream
	December to April	≈ +4 cm max of +10 cm at the level of the effluent and +6 cm downstream (March)		
Flood flows	2 years	≈ +3 cm, depending on the sections	from -3 cm to -5 cm, depending on the sections	from -6 cm upstream to -4 cm downstream
	100 years	from +3 cm (at the effluent) to -.2 cm (more downstream)	≈-7 cm upstream from Billy Diamond Highway from -3 cm to -5 cm downstream from Billy Diamond Highway	from -2 cm to -6 cm, depending on the sections

Notes: Impacts are negligible when the variation is approximately 0 cm (≈ 0 cm). For this reason, results for the northern part are presented from the effluent site on creek CE2..

Lake Kapisikama will gradually dewater as mining progresses, starting in Year 4. Indeed, the lowering of the water table by pumping mine water will result in a marked decrease in groundwater supply to this lake and creek CE4 (Section 7.2.2).

Impact on navigability

The impact on navigation (canoes) was also considered for the study area watercourses. However, the current strong presence of beavers in the study area constitutes an obstacle to navigation, with numerous dams observed during the field inventories, the locations of which and their ability to be crossed may vary depending on the year and beaver activity. For creek CE4, we expect that the flow will be intermittent during low water periods, which could compromise canoe travel. For creeks CE2 and CE3, the variations of levels and velocities expected in these small watercourses are not major (mainly because we do not expect strong decreases in water levels), so no significant degradation of potential navigation conditions is anticipated.

Climate change impacts on hydraulics and hydrology

In recent years, several studies have been done in Québec to determine the probable impacts of climate change in different regions (URSTM, 2017). Table 7-10 summarizes the climate changes predicted in these studies.

Table 7-10 Climate change outlook to 2050 in James Bay

Indicator	1981–2010 average	Outlook to 2050
Average winter temperature (December to February, °C)	-18.46	-13.3
Annual minimum temperature (°C)	-38.96	-29
Frost-free days (number)	150	179
Annual precipitation (liquid and solid, mm)	835	946
Annual precipitation of 99th centile (extremes, mm)	19	23
Accumulation of precipitation during extreme events (mm)	220	290
Days with accumulation of precipitation > 10 mm (number)	6	8
Average summer temperature (June to August, °C)	12.96	16.15
Maximum annual temperature (°C)	27.88	31.39

Source: URSTM, 2017.

According to this study, in the James Bay outlook to 2050, a minimum, average and maximum increase in temperature is anticipated, slightly more marked in winter than summer, along with an increase in the number of frost-free days. Furthermore, total annual precipitation is expected to increase (liquid and solid). However, in winter, this increased precipitation will be compensated by the rise in temperature that will reduce the maximum snowcover. The thaw season should start earlier than at present, and the floods produced by snow melt could also occur earlier, with slightly lower maximum flows. Last, extreme precipitation events could be more frequent and greater in intensity.

The calculation of the flows presented in the analysis of the project's impacts on the hydrology and hydraulics of the watercourses in the study area does not include climate change (except in the effluent discharge flows, which does include climate change). This choice was made to highlight the project's impacts, isolating them from climate change impacts, which would occur even in the absence of the project. Note that the flows presented were not used to determine structures sizes (dams, ditches, basins, culverts, pumping stations, etc.) since these were not on-site flow calculations but downstream of the mine site.

However, based on the information presented above, we can expect extreme precipitation events to be more frequent and intense, resulting in increasing peak flows due to extreme rainfall events. Thus, for creeks CE3, CE4 and CE5, climate change could reduce the project's impact by mitigating the decrease in peak flows due to extreme rainfall events presented above. However, for creek CE2, the predicted flow increase can be expected to be somewhat greater than that presented.

These qualitative considerations about climate change effects have been considered in the project's impact assessment. However, given the current state of knowledge available on the climate change effect in the region, a quantitative assessment of the impact of climate change with a high level of precision is not realistic. A more detailed analysis does not appear to be relevant for assessing the project's impact on the flood flows of the watercourses in the study area.

IMPACT ASSESSMENT

The impact assessment was conducted considering the most critical configuration, as well as the overall footprint of the project, dewatering flows from the pit and effluent discharge into CE2. The impact was evaluated in terms of the contributory area for the six watercourses of the study area, characteristic flows and water levels. Although changes will occur in the watersheds of the study area that will lead to significant changes in characteristic flows of the watercourses, the impact on the water levels and velocities of the watercourses remains moderate due to the land configuration (very flat and marshy with many controls). The intensity of the impact on the hydrological regime of the watercourses of the study area is therefore considered to be moderate. Its extent is considered local, since not all of the watercourses in the study area will be impacted, and for those that are, the effect on water levels and velocities becomes negligible at the boundary of the study area. The duration is long, since the impacts will occur during all phases of operation. The significance of the impact on the hydrological regime during the operation phase is therefore **moderate**.

REHABILITATION AND POST-REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling.
- Pit rehabilitation.
- Water management.

MITIGATION MEASURES

Mitigation measures SUR 03, QUA 07, QUA 09 and QUA 11 will have to be applied in order to limit the impact on the hydrological regime in the study area during the rehabilitation phase, along with standard NOR 01, described in Table 7-5.

DESCRIPTION OF IMPACT

The rehabilitation phase involves decommissioning and returning the site to its original condition (backfilling, grading of surfaces, revegetation, securing of the site, temporary works and structures, etc.). During this phase, the dismantling of facilities could change the natural flow of surface water, such as the removal of roads and pumping stations for runoff.

Once rehabilitation of the site is complete, the infrastructure for water management on the site will be dismantled (retention pond, WTP, effluent, **culverts and ditches**), which will make it possible for watercourses **in the study area** to return **to their original watersheds in terms of area**. **Furthermore,** the suppression of mining effluent by pumping will make it possible for creek CE2 to return to a natural flow regime. The presence **of the revegetated stockpiles** (steep slope) will **nonetheless** have a permanent impact on the topography of watersheds **CE2, CE3 and CE4**, formerly very flat and marshy, resulting in greater reactivity to precipitation. **In other words, the concentration time of these watersheds will decrease slightly, and the unit peak flow rate will increase slightly. Efforts will be made, however, to encourage the wetland creation, where possible, in low slope areas to limit this peak flow increase.**

Table 7-11 presents the exact watershed areas for the restoration phase. Creek CE2 will be restored to its original area and creek CE5 very close to its original area (-1%). We expect no significant impact on the characteristic flows of these watercourses compared to pre-project conditions. The creek CE4 watershed will be permanently encroached by 9% and we can assume that the characteristic flows in creek CE4 will then be approximately decreased proportionally to this decrease in area, compared to pre-project conditions.

Concerning creek CE3, the pit presence in the watershed should be noted. During the first part of the post-rehabilitation phase, the pit will progressively flood by natural precipitation and overflow is not expected in approximately the first 100 years (according to the hydrogeological study estimates). It should be recalled that during the operation phase (see previous section), in addition to the loss of watershed for certain watercourses due to the mining infrastructure, pit dewatering will play a part in exacerbating the decrease in base flows of the watercourses under study, especially creek CE3. During the rehabilitation phase, after stoppage of pumping and with the gradual filling of the pit, creek CE3 base flow shall gradually recover. The watershed of creek CE3 will then have a surface area of approx. 9.78 km² at Asiyan Lake outlet, at the confluence with creek CE4, which constitutes a decrease of 5% as compared to current conditions. We can estimate that characteristic flows of creek CE3 will be approximately reduced proportionately with this reduction in area as compared to pre-project conditions.

Then, after approximately one hundred years, it was estimated that the pit will be full and may potentially start discharging excess precipitation like a natural lake would do. The overflow, the exact characteristics of which are unknown at this stage of the project, shall be directed towards creek CE3. The watershed of creek CE3 will therefore increase to about 10.79 km² at the Asiyan Lake outlet, representing an increase of 4% as compared to current conditions. We can assume that the approximate increase in characteristic flows of creek CE3 will be proportional to the increase in surface area. However, the presence of the lake created by the pit flooding, along with efforts to create wetlands on the site, will cause a reduction in peak flows during periods of high hydraulicity.

Table 7-11 Impact of the project on the watersheds in the study area during rehabilitation

	Area (km²)		
Water body	Current condition	Post-Rehabilitation	Difference (%)
North part	**19.81**	**19.78**	**0**
CE1	7.63	7.63	0
CE2	9.07	9.04	0
CE6	3.11	3.11	0
South part	**48.76**	**47.77 (0-100 years)** **48.78 (> 100 years)**	**-2 (0-100 years)** **0 (> 100 years)**
CE3	10.33	9.78 (0-100 years) 10.79 (>100 years)	-5 +4
CE4	3.03	2.76	-9
CE5	27.01	26.84	-1

IMPACT ASSESSMENT

Since the areas affected **are** as large as during operations and changes are expected to the hydrological regime. **Essentially, the changes are to approximate the hydrological conditions that existed before the mine project was implemented. However, two watercourses will not return to their original conditions, and runoff conditions on the site will change slightly. For these reasons,** the intensity of the impact is therefore considered moderate. Its extent will be local, since the impacts will occur within the local study area and its duration long, since the change will be permanent. The significance of the impact on the hydrological regime during the rehabilitation phase is therefore **moderate.**

7.2.4 WATER AND SEDIMENTS

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Water management.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Standard mitigation measures QUA 01 to QUA 04, QUA 08 to QUA 13, NOR 02 to NOR 04, NOR 07 to NOR 09 will be applied to reduce the impact of the project on water quality and sediments. These measures are presented in Table 7-5. Measures SUR 01 to SUR 04 will also help to monitor the impacts on the quality of water and sediments.

DESCRIPTION OF IMPACT

During the construction phase, road transport, heavy machinery traffic, use of refuelling sites and temporary storage or handling of hazardous and waste materials will constitute potential sources of accidental spills that could contaminate the water and sediments. However, the risk of accidental spills is reduced by the application of mitigation measures. These measures will be aimed on prevention thanks to a regular monitoring of the equipment and the addition of emergency devices that allow for prompt response in the event of an accident. An accidental spill, if it occurs, will saturate the soils with contaminants at the spill site. If a significant volume is released, a portion of the product that has not adhered will migrate down into the groundwater table or toward the surface water, leaving a floating or sinking pure phase, depending on the liquid, and partly dissolving in the water. Therefore, it will be important to take swift action in the event of an accidental spill and recover the contaminated soils.

Contaminated groundwater will flow as per the local hydrogeological network. The impact of a potential spill will be, among other things, based on the volume of contaminants spilled, the uniqueness (spill) or the repetition (leak) of the problem and aquifer vulnerability at the spill site. Risk of a major spill at the site will be close to zero and the significance of the impact even lower since the volumes of potential spills linked to machinery will be limited. In addition, in the event of a spill, the cleaning and reporting procedure or emergency plan will be implemented, which will reduce the extent of the contamination and prevent contamination of the groundwater.

Moreover, access roads and routes will have to be maintained to ensure the safety of the workers. Use of ice melters to ensure the safety of routes during winter, could increase the salt concentration in surrounding soil and affect the quality of water and sediments. Seepage of surface water into the soil could carry a portion of these ice melters toward the groundwater table. Groundwater salinity could increase beneath the access roads in places where aquifer is most vulnerable. Considering that ice melters are rarely used and considering the dilution, dispersion and retention phenomena, a significant increase in groundwater salinity is highly unlikely. The ice melter used will be approved by the MTMDET and MELCC.

IMPACT ASSESSMENT

During the construction phase, the intensity is low, whether for risks linked to spills, or those linked to petroleum products or other hazardous materials. The mitigation measures to be applied will efficiently reduce the anticipated impacts. The extent is local given that the contamination would occur in an area confined to work site. Its duration is rated as short since it is limited to the period of construction. In short, the significance of the impact is **minor**.

OPERATION PHASE

SOURCES OF IMPACT

- Presence and operation of the pit.
- Other infrastructures in operation.
- Management of economic material, overburden and waste rock.
- Water management.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Standard mitigation measures QUA 01 to QUA 06, QUA 12, NOR 02 to NOR 04, NOR 06 to NOR 09 will be applied to reduce the impact of the project on the quality of water and sediments. These measures are presented in Table 7-5.

DESCRIPTION OF IMPACT

Use and maintenance of the machinery during the operation phase could affect the quality of water and sediments. Development of the sites designated for the project's different infrastructure and the site's normal operations will require the use of vehicles, equipment and heavy machinery. Use, maintenance and transporting of this equipment will emit certain substances into the environment. Potential of leaks or accidental spills during use will increase the risk of contamination of water and sediments by hydrocarbons or other contaminants. The petroleum product storage area and mechanic's shop pose an additional risk. Consequently, leaks at these installations could generate a contamination of the water and sediments. Nevertheless, the impact of these leaks would usually be limited if quickly detected and managed.

The waste rock stockpiles could be a source of impact according to the geochemical properties of waste rock and tailings. Therefore, during operation, runoff percolates through the stockpile and could leach some metals. As presented in Section 4.7.1, waste rock is "low risk" under D019. In addition, according to this same directive, waste rock from all lithologic units would be considered leachable, at varying degrees. Results from tests on tailings, when compared to D019 criteria, reveal that all tailing samples were also considered to be "low risk". Pit dewatering water could also contain metals. With drainage around the stockpiles to collect precipitation water percolating through the tailings and waste rock, and a percolation flow that complies with D019 below the stockpiles, surface and groundwater as well as sediments around the site will be preserved from contamination that may come from this source. All contact water from the site will be collected by the ditch system, pumped to the main water retention basin located on the northwest side of the site. Runoff from the organic and overburden stockpiles will also be collected and conveyed to the same retention basin where particulate matter will settle. The dewatering water from the pit will also be pumped and directed into the site's main water retention basin.

The pumps will be electric and the response time in the event of a hazardous product spill will be fast enough that the impacts associated with potential contamination are considered to be almost nil.

Following the analyses to be performed on the water in the main retention basin, a water treatment plant could be used to treat the water to remove or reduce contaminants that may exceed the D019 criteria. Based on the latest modelling (WSP, 2021b), the pH at the retention basin effluent is expected to remain between 7.4 and 7.7, and the metal concentrations in the effluent below the monthly average concentrations recommended by D019. However, water quality may exceed the criterion for arsenic under dry conditions. Arsenic concentrations are predicted to meet D019 generally in May and June but will exceed the criterion (0.2 mg/L) as precipitation decreases during the summer months around Year 8. Therefore, arsenic treatment may be required under dry conditions beginning in Year 8 of operation.

The water that was in contact with pit walls and waste rock, and then returned into the natural environment, will undergo treatment beforehand. The MDMER authorizes effluents if the pH is between 6 and 9.5, if the concentration ranges in the effluent do not exceed the authorized limits, and if the effluent has proven to be non-toxic. In addition, the effluent must comply with the criteria of D019 and the EDOs which will be specifically established for the project. Therefore, while in compliance to EDO standards, negative impacts on water quality will be limited. The quality of the surface water and groundwater will be monitored in real time throughout the mining operations. The details of the program are presented in Chapter 10.

IMPACT ASSESSMENT

During the operation phase, intensity is low because the protection measures implemented to prevent spills and the migration of contaminated water toward the natural environment will be sufficiently effective. Extent is local since several bodies of water in the study area are affected by the project. During operation, the impact is felt on a discontinuous basis, therefore the duration is moderate. The significance of the residual impact on water and sediments is considered **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling
- Pit rehabilitation.
- Water management.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Standard mitigation measures SUR 01, SUR 03, SUR 04, QUA 01 to QUA 04, QUA 07, QUA 08, QUA 10 to QUA 12, SUR 03, NOR 01 to NOR 04, NOR 09 to NOR 10 will be applied to reduce the impact of the project on the quality of water and sediments. These measures are presented in Table 7-5.

DESCRIPTION OF IMPACT

During the rehabilitation phase, general decommissioning activities, management of hazardous and waste materials, water management and transport could have a negative affect the quality of water and sediments. Therefore, the impacts described in the construction phase also apply to the rehabilitation phase.

Moreover, the impacts are like those in the operation phase in regard to the waste rock stockpile, main retention basin and its WTP treatment prior to its return in the receiving environment, since water infrastructure will remain in place in spite of site rehabilitation, and this, until the effluent meets D019 requirements.

IMPACT ASSESSMENT

Similarly to during the construction period**, negative impacts linked to the risks of contamination of groundwater by accidental spill and the spreading of ice melters in the winter are expected during the rehabilitation phase. Moreover, impacts are like those in the operation phase in regard to the waste rock stockpiles since infrastructure will remain in place in spite of site rehabilitation.** The mitigation measures that will be applied will efficiently reduce the anticipated impacts and hence, the intensity is low. The extent is local since the work will be confined within the limits of the local study area. The duration is short since site rehabilitation will be conducted over a one-year period. The significance of the impact on the quality of water and sediments is therefore considered to be **minor**.

POST-REHABILITATION PHASE

During the post-rehabilitation phase, the pit will gradually fill up with water. Due to reduced groundwater inflow, the pit lake recharge will mainly come from precipitations. The quality of the pit lake water could deteriorate since part of the water from precipitations will be exposed to the rock walls.

Modelling results for the quality of the water that will accumulate in the pit (WSP, 2021b) show that the water quality will meet the D109 guidelines when the pit is full, before natural discharge to the environment. When the pit is full of water, the pH will remain at 8 and dissolved arsenic below the D019 criterion of 0.2 mg/L. However, during backfilling, arsenic levels will exceed D019 until year 62 post-closure.

In addition, post-rehabilitation activities will recreate surface runoff conditions similar to initial conditions. The groundwater flow regime is expected to essentially return to its original state. The pit lake will have an outflow toward creek CE3. When the infrastructure for water management on the site is dismantled, the surface water's physicochemical nature will return to its initial condition.

7.2.5 ATMOSPHERE

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures AIR 01 to AIR 05 and standard NOR 11 described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

During the construction phase, contaminant emissions in the air related to the project are primarily linked to truck traffic, unloading of materials, soil stripping and the deployment of equipment (WSP, 2018*c*). Deterioration of air quality can have effects on the health of the fauna and flora through deposition and on human health through inhalation. The extent of the effects depends on amount of contaminants emitted into the atmosphere and duration of exposure to contaminants.

The results of the modelling survey on human sensitive receptors identified, reveal that the standards of the *Clean Air Regulation* (CAR) and Canadian Ambient Air Quality Standards (CAAQS) for gaseous compounds and total particulate matter are met with the exception of the Canadian **nitrogen dioxide** standard **for the one-hour period** (Stantec 2021). The modelling survey therefore shows that the deterioration of the quality of the atmosphere by gaseous compounds **extends beyond the project boundary and reaches the primary land users. Concerning** particulate matter, **it will be confined** to the site and its immediate environment and **will not affect** the primary users. The combined effects on human health, fauna and flora are **considered low** for the construction phase.

In addition, in regard to GHG emissions, it was calculated that the project's construction activities **(18 months)** will emit **27.9 tCO_2eq (Stantec, 2021**, Appendix C).

IMPACT ASSESSMENT

The impact of the dust and other disturbances on the quality of the atmosphere during construction is considered low intensity based on the remoteness of the planned activities versus the nearest sensitive receptors. Nevertheless, certain disturbances (dustfall, for example) may be felt in some sections of the study area, conferring a local extent to this impact. In addition, the sectors in question can vary depending on the day, based on weather conditions since the disturbances will necessarily be dependent on the winds. The duration of this impact is short since it is limited to the period of construction. The impact on the quality of the atmosphere during the construction phase is therefore considered to be of **minor** significance.

OPERATION PHASE

SOURCES OF IMPACT

- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of economic material, overburden and waste rock.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures AIR 01 to **AIR 07** and the NOR 11 standard described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

The impact associated to an increase in particles and metals in the air during the operation phase, was determined by an air dispersion modelling survey of contaminants for Year 14 of operation. The detailed results during the operation phase are presented in the air dispersion modelling study (Stantec, 2021). The scenario was developed such as to represent the worst conditions during operation.

The study concludes to the modelling of occasional exceedances of the total particle standards from the *Clean Air Regulation*, at the limit of the application of standards and criteria, as identified as 300 m away from operations. Exceedances are mainly found **south** of the pit. However, for all sensitive receptors, no exceedance from the standard is expected.

For all metals and gaseous compounds, the maximum concentrations meet standards and criteria, and this, both at the limit of application and at sensitive receptors **with the exception of the Canadian nitrogen dioxide standard for the one-hour period. The modelling for nitrogen dioxide shows that the air quality degradation extends beyond the project boundary and reaches the primary users.**

Crystalline silica **also shows** criteria exceedances (one-hour and yearly). Exceedances **of the application limit** are infrequent for the one-hour criterion. **However, no exceedances are observed at sensitive receptors.** For the yearly criterion, the only inhabited sensitive receptor exhibiting an exceedance is the km 381 truck stop. Concentrations modelled at other inhabited receptors such as the Cree camps nearby the site, are all below the limit value.

The dust management plan implementation (Stantec, 2021) will ensure the monitoring of the concentrations emitted into the atmosphere and the application of appropriate mitigation measures to limit the impacts.

During the operation phase, several activities such as road transport, traffic, operating of machinery, and propane use, are likely sources of gaseous contaminants, including GHG emissions. GHG emissions linked to mining activities were estimated annually and for the entire project duration (Appendix E). The estimation is based on Galaxy's data for the different mining activities and considers direct and indirect sources. **During the operation phase, the average annual emissions will be 32,273 tCO_2eq. Indirect emissions from the project are estimated at 12,137 tCO_2eq annually.**

IMPACT ASSESSMENT

Despite the exceedances of certain standards and criteria at the sensitive receptors, the intensity of the impact on the quality of atmosphere during the operation phase is considered to be low intensity because **of the application of the dust management plan**. The extent of this impact is local since the impacts are felt nearby the mining activities, within the local study area. Lastly, the duration of this impact is considered to be moderate and will continue to be felt throughout the years the mining site will operate. In short, the impact of the project on the quality of the atmosphere is considered of **minor** significance.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling
- Pit rehabilitation.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures AIR 01 to AIR 03 along with the NOR 11 standard described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

The impact on the quality of the atmosphere during the mine rehabilitation phase is linked to the same activities as in the construction phase, although the latter are less likely to emit dust. However, as for the other project phases, **the degradation of the quality of the atmosphere will be felt in the periphery of the site and in its immediate environment.**

IMPACT ASSESSMENT

The impact of the dust and other disturbances linked to the quality of air during the rehabilitation phase is considered to be low intensity due to the significant reduction in industrial activities. The extent is local since it could spread all over the mining site and its periphery. In regard in the anticipated negative impacts, its duration is short because the rehabilitation work will be completed within a few years. The impact on the quality of the atmosphere during the rehabilitation phase is therefore considered to be of **minor** significance.

POST-REHABILITATION PHASE

Once the site has been restored, impacts will be non-existent, since no mining activities that would affect the quality of the atmosphere will be taking place.

7.2.6 ARTIFICIAL LIGHT AT NIGHT

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures LUM 01 to LUM 03 (Table 7-5) will be implemented to minimize the project's impact on artificial light at night.

DESCRIPTION OF IMPACT

Activities that involve fixed or mobile lighting during the construction phase could result in the emission of artificial nocturnal light into the sky and work site limits, which are likely to disturb nocturnal landscapes and have an impact on the biological and social environments on the periphery. Light levels from these facilities and the use of mobile equipment have not been modelled, since this is a temporary situation and the sources will emit very little light compared with developments in the operation phase.

IMPACT ASSESSMENT

The intensity is considered low. The extent is considered localized, since artificial nocturnal light emitted during the construction phase will affect a small area in the study area. The duration is short. The significance of the impact during the construction phase is considered **minor**.

OPERATION PHASE

SOURCES OF IMPACT

- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of economic material, unconsolidated deposits, and waste rock.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures LUM 01 to LUM 03 (Table 7-5) will be implemented to minimize the project's impact on artificial light at night.

DESCRIPTION OF IMPACT

To accurately assess the impact that **planned facilities in the operation phase** will have on artificial nocturnal light, a photometric modelling of the light levels was carried out using AGI32 lighting analysis software, version 18.3 (AGI32 Light Analyst, Illumination Engineering Software).

This modelling was conducted as part of the 2018 EIA and was presented as an appendix to that EIA (WSP, 2018c). The modelling has not been redone to account for changes to the project as the anticipated impact will be of the same order of magnitude as that predicted in 2018.

The addition of new nocturnal light sources related to the project's facilities will locally alter the sky brightness conditions. The results of light to the sky show a low-intensity light level. The average calculated at 100 m above the tallest building in winter is 0.2 lux for the entire local study area. The light points in the sky are concentrated above the administrative and industrial area (maximum level reached 8.3 lux), stockpiles (approximately 6 lux), and to a lesser extent above the pit (approximately 1 lux), since the light is found under the present elevation of the soil around the pegmatite mound. Road-related lighting also projects low light onto the sky (approximately 0.5 lux). These changes in the brightness of the sky will locally alter the environmental area, which is currently representative of a sector that is slightly impacted by the brightness (C1) toward an area characteristic of a low-brightness sector (C2). **Although the infrastructure (administrative and industrial sector as well as the stockpiles) have been positioned closer to the truck stop compared to the 2018 project,** the additional supply of light should not be sufficient to alter the environmental area attributed to the truck stop, which is already C2 because of the lighting already present at the site.

Expected changes in the brightness of the sky will have very little effect on the sky glow. The effects will only be visible near lit areas. The change will be barely perceptible on all other sensitive receptors in the study area, including permanent Cree campsites. Local alterations in the brightness of the sky will have very little effect on the uses of the territory (traditional or otherwise) on the periphery for facilities planned for the mine's operation.

The addition of new nocturnal light sources in connection with the facilities required by the project will not result in the emission of light trespass. The modelisation results show that light levels at 1.5 m from the ground at limits of the local study area will be zero. The light is only concentrated at the edge of the lit areas. Therefore, no impact of a light trespass source is expected on the quality of life for humans, their uses of the territory (traditional or otherwise), on the periphery of facilities planned for the mine's operation.

Side views **were** modelled **in 2018** using two sensitive receptors, the km 381 truck stop and the permanent Cree camp to the south. The results of the visual side simulation **then showed** that at the km 381 truck stop, the light emitted by future facilities will not be directly visible due to the area's rugged topography, which limits the direct view into the site. On the other hand, a slight sky glow will be perceptible in the sky, which will locally impact the quality of the nocturnal landscape in the area. The same observation can be made at the permanent Cree camp. The glow will be more visible in the presence of clouds, this is the artificial nocturnal light emitted by ground facilities, which has the effect of increasing the visibility of sky glows in addition to reducing the brightness of the sky. **These results are still considered valid in the 2021 design.**

In the context of the project, the environmental effects of artificial nocturnal light on the biological environment are considered insignificant due to the low level of light generated to the sky and the absence of light trespass at the limits of the local study area.

IMPACT ASSESSMENT

During the operation phase, the probable residual impacts of the project on artificial light at night mainly affect the social environment. Effects on the biological environment will be minor due to the low level of light generated to the sky and the absence of artificial light at the limits of the local study area. Therefore, the expected impacts are more specifically assessed on the **brightness of the sky** and **nocturnal landscapes**. The impact intensity on artificial light at night is considered low, since the brightness of the sky and quality of the nocturnal landscapes will be slightly altered, and it is unlikely that these changes affect users of the area. The extent is considered local considering that the impact will be concentrated on the site itself and a few hundred metres around. The duration is medium, since the impact will only be felt during the operation phase and is not permanent. The significance of the impact during the operation phase is considered **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures LUM 01 to LUM 03 (Table 7-5) will be implemented to minimize the project's impact on artificial light at night.

DESCRIPTION OF IMPACT

The activities mentioned above that involve fixed or mobile lighting during the rehabilitation phase could temporarily result in the emission of artificial nocturnal light into the sky and work site limits, which is likely to disturb nocturnal landscapes and have an impact on biological and social environments on the periphery. The light levels from these facilities and the use of mobile equipment have not been modelled, since this is a temporary situation and the sources will emit very little light compared to the facilities that will be present during the operation phase, in the same place.

IMPACT ASSESSMENT

During the rehabilitation phase, the facilities that will be lit and the use of equipment and machinery that will require lighting for operations and worker safety will be temporary and emit very little artificial nocturnal light. The intensity is considered low. The extent is considered local, since the artificial nocturnal light emitted during the rehabilitation phase will affect a small area in the local study area. The duration is short. The significance of the impact during the rehabilitation phase is considered **minor**.

POST-REHABILITATION PHASE

As the activities on the site will be completed during the post-rehabilitation phase, no impact is anticipated on artificial light at night.

7.2.7 AMBIENT NOISE

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures SON 01 and SON 02 as well as NOR 12 described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

A simulation during the construction phase was set up during the busiest periods in terms of equipment and noisy work simultaneously. The scenario includes **the construction of the mining complex and the start of pit operations**, when there will be the most trucks at the site. At this stage of the project, the construction methods and details (number, type of equipment, etc.) are not exactly known. Hypotheses were necessary to be able to establish the most likely scenarios to occur on the same day. **Appendix H presents the modelling methodology and results.**

The noise criteria for the daytime period are based on a 12-hour period. It was considered in the model that the work would only be done during the day (between 7 a.m. and 6 p.m.**, with a one-hour break**), for a 10-hour period. Galaxy does not foresee any problems in complying with the noise standard of 55 dBA between 7:00 a.m. and 7:00 p.m.

IMPACT ASSESSMENT

The impact intensity is considered low since the sound impacts assessed during the construction phase comply with the **MELCC** criteria for construction sites. The extent is considered local considering that the impact will be felt on the periphery of the mine site, including the km 381 truck stop. Its duration is short and it will spread over the entire construction. The significance of the impact on the ambient noise during the construction phase is therefore considered **minor**.

OPERATION PHASE

SOURCES OF IMPACT

- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of economic material, unconsolidated deposits, and waste rock.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures SON 01 to SON 03 as well as NOR 12 described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

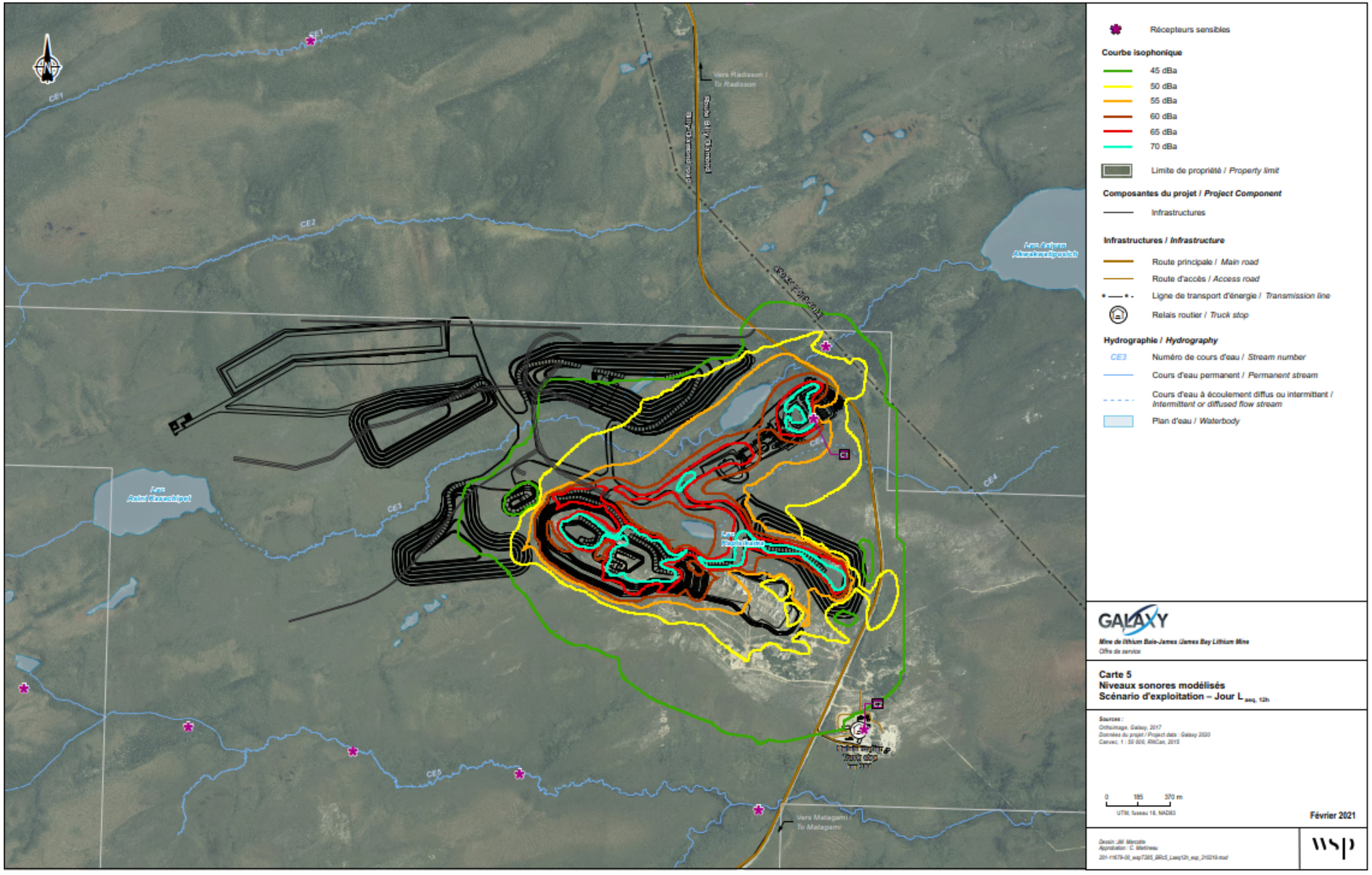
To assess the extent to which noise may be detrimental to well-being, sound criteria have been established within D019. This directive indicates average hourly sound levels for the diurnal and nocturnal periods that should not be exceeded. These values are based on the prescriptions of Instruction Note 98-01 on noise of the MDDELCC, according to the uses permitted by a municipal zoning by-law. The project falls within zone IV (non-sensitive area) and the applicable noise criteria are 70 dBA at night, except for the Cree camp and the km 381 truck stop, and 55 dBA during the day or residual noise, if higher. For those two other sites, the criteria are 55 dBA at night and 50 dBA during the day.

A simulation of sound propagation to assess the project's noise emissions with tailwinds was conducted in year **12** of the operation **(in 2035)**, the year when the production level would be the highest. Map 7-3 presents the iso-contours of noise as modelled during the operations. **Appendix H presents** the detailed results of this modelling from a separate study (**WSP, 2021c**). The most restrictive noise level to be met is that generated during the nocturnal period and it is set at **45** dBa ($L_{Aeq\ 1h}$). Considering all of the mine's emission sources, its maximum sound impact for the nearest sensitive receptor is assessed at **44** dBa (km 381 truck stop).

For the transport of the concentrate using the Billy-Diamond highway, particular attention was paid to the sensitive areas that could be located near the road between the mine and Matagami and where the ambient noise level would be disturbed by the addition of transport trucks to the current traffic. A 1% per year increase in traffic was observed between 2014 and 2017 on the Billy-Diamond Highway. This same 1% per year increase was applied to determine the current and 10-year traffic flows. The impact resulting from the change in traffic by the addition of concentrate trucks was determined according to the noise impact assessment grid of the Politique du bruit routier of the Ministère des Transports du Québec. According to this assessment grid, the noise impact produced by the Galaxy project's increase in traffic on Billy-Diamond highway is not significant and will therefore not be felt in the study areas.

IMPACT ASSESSMENT

The impact intensity during the operation phase is considered low, since the sound impact is in accordance with the limit of 50 dBA at night, even in tailwind conditions, considering all sources of noise are simultaneously active. The extent of this impact is local because it will encompass the entire mining site as well as a zone of influence on the periphery of it. This impact will be of short duration and intermittent, occurring during the operation period, approximately **18** years. Overall, this impact is considered of **minor** importance.



Map 7-3 Modelled Noise Levels – Operation Phase – L_{Aeq1h}

Source: WSP, 2021c.

REHABILITATION PHASE

SOURCES OF IMPACT

— Infrastructure dismantling
— Pit rehabilitation.
— Transportation and traffic.

MITIGATION MEASURES

Mitigation measures SON 01 and SON 02 as well as NOR 12 described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

As with the construction phase, the rehabilitation methods and details (number, type of equipment, etc.) are not exactly known. The results modelled during the construction phase are in accordance with the standards, and the work required during rehabilitation is similar to that during construction.

IMPACT ASSESSMENT

The impact intensity is considered low since sound impacts during the rehabilitation phase will be in accordance with D019. The extent is considered local given that the impact will be felt on the periphery of the mine site. Its duration is short, since all of the activities in the rehabilitation phase will take place over a period of one year. The significance of the impact on the ambient noise during the rehabilitation phase is therefore considered **minor**.

POST-REHABILITATION PHASE

As there will be no more activity at the site during the post-rehabilitation phase, there will be no impact on the ambient noise.

7.2.8 VIBRATIONS AND OVERPRESSURE

CONSTRUCTION PHASE

SOURCE OF IMPACT

— Site preparation and infrastructure construction.

MITIGATION MEASURES

Mitigation measures VIB 01 to VIB 04 and NOR 13, described in Table 7-5, will be applied.

DESCRIPTION OF IMPACT

Blasting is planned during the construction phase for the **pit** operation. These activities will cause vibration and air overpressures.

IMPACT ASSESSMENT

The intensity of the impact is considered low, since the activities during construction will be marginal. Its extent is considered local given that vibration and air overpressures could be experienced in the periphery of the **pit**. Its duration is short, since the impact will be felt intermittently, during blasting. The significance of the impact of vibration and air overpressures during the construction phase is therefore considered **minor**.

OPERATION PHASE

SOURCE OF IMPACT

— Presence and operation of the pit.

MITIGATION MEASURES

Mitigation measures VIB 01 to VIB 04 as well as NOR 13, described in Table 7-5 will be applied.

DESCRIPTION OF IMPACT

The impact assessment was carried out considering the use of a load of **175** kg of explosives per hole 152 mm in diameter, an explosive density of 1.2 t / m^3 and a solid packing collar height of 3 m.

The vibration criterion of D019 for structures and sensitive human areas is 12.7 mm/s. Assuming a maximum of four holes exploding in 8 ms, the threshold is respected for the nearest structures, which are the km 381 truck stop (**6.3** mm/s), the industrial sector (**7.7** mm/s) and the worker camp (**4.0** mm/s). For fish, the criteria established in the *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky, 1998) is a pressure of 100 kPa in their swim bladder. This pressure is reached at a distance of **133** m from the detonation, assuming the same parameters indicated above. Since the minimum distance between the pit and the nearest watercourse will be **230** m (creek CE3), the detonations will be compliant. As indicated in the specialized study on the aquatic habitat (WSP, 2018*d*), there are no spawning grounds or potential spawning sites in creek CE3. However, creek CE5 has a potential to have spawning ground. The criterion is 13 mm/s in a spawning ground during the period when eggs are incubating. A vibration level of 3.9 mm/s is calculated in the pit location closest to creek CE5 (**920** m), which is compliant.

Regarding air overpressures, the criterion of D019 is 128 dB for sensitive populated areas. The air overpressure calculation is **119** dB for the km 381 truck stop and **116** dB at the worker camp. The calculations assumed the absence of temperature inversions and tailwinds. These parameters could therefore increase the values by 10 dB, under certain conditions. As a result, mitigation measure VIB 03 will make it possible to maintain the thresholds within adequate levels.

Furthermore, flying rock during blasting will be minimized by using blasting mats and a stuffing collar at least 5 m high when done in sensitive sectors.

IMPACT ASSESSMENT

The intensity of the impact is considered low, since the level of vibration and air overpressures assessed during the operation phase comply with the criteria of D019 and Fisheries and Oceans Canada. Its extent is considered local given that vibration and air overpressures may be experienced on the periphery of the mining site, at the km 381 truck stop and along the James Bay road. The duration will be short, since the impact will be felt intermittently, at the time of blasts. The significance of the impact of vibration and air overpressures during the construction phase is therefore considered **minor**.

REHABILITATION PHASE

Does not apply, since there will be no activity that could generate vibration and air overpressures during rehabilitation work.

POST-REHABILITATION PHASE

Does not apply since there will be no more activity on the site.

7.2.9 COMPARISON OF THE DESCRIPTION OF THE IMPACTS ON THE PHYSICAL ENVIRONMENT 2018 VS 2021

This section summarizes the changes to the current impact description and assessment compared to those described in the 2018 EIA. Table 7-12 summarizes the components of the physical environment in the study area and, by project phase, shows the changes to the description and assessment of impacts based on the 2018 and 2021 projects, where applicable.

Table 7-12 Comparison of the project impact description and assessment on each physical component of the local study area

Component	Phase	Change to the impact description	2018 project impact importance	2021 project impact importance
Soil	Construction, operation and rehabilitation	-	Minor	Minor
Hydrogeology	Construction	-	Minor	Minor
	Operation, rehabilitation and post-rehabilitation	The hydrogeological modelling has been updated to reflect non-significant changes	Moderate	Moderate
Hydrological regime	Construction	Water will be drawn from Lake Kapisikama to feed the mobile concrete plant	Minor	Minor
	Operation, rehabilitation and post-rehabilitation	Watershed area and flow impact calculations have been updated to reflect non-significant changes	Moderate	Moderate
Water and sediments	Construction	-	Minor	Minor
	Operation and rehabilitation	Water quality modelling of the contact water catchment basin has been updated. The treatment applicable to the WTP does not result in a change to the residual impact.	Minor	Minor
Atmosphere	Construction, operation and rehabilitation	The general movement of infrastructure to the east does not result in significant changes.	Minor	Minor
Artificial light at night	Construction, operation and rehabilitation	-	Minor	Minor
Ambient noise	Construction and rehabilitation	-	Minor	Minor
	Operation	Noise modelling has been updated and noise levels remain similar at the receptor. The increase in noise due to transportation on Billy-Diamond highway has been considered and no significant changes are anticipated.	Minor	Minor
Vibrations and overpressure	Construction, operation and rehabilitation	-	Minor	Minor

7.3 IMPACTS ON THE BIOLOGICAL ENVIRONMENT

7.3.1 VEGETATION AND WETLANDS

CONSTRUCTION AND OPERATION PHASES

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Presence and operation of the pit.
- Management of process plant feed material, overburden and waste rock Transportation and traffic.
- Hazardous and waste materials management.

MITIGATION MEASURES AND COMPENSATION

Mitigation measures VEG 01 to VEG 07, SUR 01 to SUR 04, QUA 01 to QUA 05, QUA 10 to QUA 12 should be applied, as well as standards NOR 02 to NOR 04, NOR 10 and NOR 15, described in Table 7-5.

To make up for inevitable losses of wetlands, a compensation program will be developed to comply with MELCC requirements (NOR 15). This program will be prepared and presented to the MELCC with the application for mining authorization **for the construction of the project**.

A compensation program to make up for the inevitable losses of wetlands will be developed to comply with MELCC requirements (see Measure NOR 15) and will be submitted to the MELCC as part of the authorization of construction work application. The detailed wetland compensation plan proposed by Galaxy will comply with MELCC requirements for mining projects in the Nord-du-Québec territory. The proponent has already committed to preparing a compensation plan that will be developed in close collaboration with the MELCC and the Eastmain Cree community, and will therefore take into account the expectations and requirements formulated by the latter.

A meeting with local stakeholders is planned for the six months following the issuance of the Order, to gather concerns and suggestions and to specify the preferred compensation options. Following the consultations, the main avenues for compensation will be presented to the MELCC and stakeholders for preliminary analysis. The results of this analysis will guide the development of the final compensation plan that will be produced as part of the environmental authorization applications for the construction phase.

It is currently too early to detail the projects, works or measures that could be included in the compensation plan, but it is possible to outline the general strategies that could guide the development of the compensation plan. The creation or restoration of different types of wetlands will be targeted, which will promote specific biodiversity and habitats. Environmental gains could result by increasing the presence of regionally rare environments. These measures will have to establish environments that will fulfill, at maturity, the ecosystem functions specific to northern wetlands, including carbon sequestration. The focus will be on local and regional projects based on the expectations of the affected communities.

It is important to note that the northern and isolated context of the project means that there are currently few projects under development in which the proponent could offer its participation to enable their realization. However, the compensation plan could include helping to restore abandoned mine sites in the Nord-du-Québec region. Financial contributions for research could also be considered, particularly with regard to acquiring fundamental and applied knowledge on boreal wetlands in Northern Quebec through partnerships with various researchers from universities, such as Nicole Fenton (UQAT), NSERC-UQAT Industrial Chair on Northern Biodiversity in a Mining Context, and Line Rochefort (ULaval), Industrial Research Chair in Peatland Management. Finally, financial compensation may be part of a set of compensatory measures.

Once all the steps have been completed and discussions have been held with the Eastmain Cree community, including the Tallymen and land users, as well as the MELCC on possible compensation projects, a detailed version will be submitted to the MELCC after the order authorizing the project is issued.

DESCRIPTION OF IMPACT

DIRECT AND INDIRECT IMPACT ON VEGETATION AND WETLANDS

The anticipated impacts on vegetation are primarily related to the destruction and modification of natural habitats. These impacts will be caused by the deforestation and excavation necessary to prepare the site and by the construction of temporary or permanent infrastructure. It is important to note that the construction of waste rock and overburden stockpiles as well as expansion of the pit will take place continuously during the operation phase. To provide an overview of the area of natural environments that will be affected by the construction of all infrastructure, it was considered relevant to merge the construction and operation phases in describing the impact.

The work required for future development of mining infrastructure will result in the transformation of roughly 145 ha of terrestrial environment and **305** ha of wetlands. **It should be noted that the project optimization has made it possible to completely avoid encroachment into the plant groups that are part of the hydric environments, with the exception of a large peat bog pond.** Table 7-**13** lists the area of natural environments affected for all project infrastructure, by type of grouping observed in the study area. **Table 7-14 shows the affected** areas **as well as** the stripped areas around the infrastructures, i.e. a **50-m buffer strip that includes the** 35-m **protective zone that will be stripped** to protect the **infrastructures** from potential forest fires. The initial condition of these environments prior to activities is generally non-degraded.

In addition to areas directly affected by work, the development of the site and projected infrastructure will have an indirect impact on plant communities preserved. On the one hand, work will fragment ecosystems and could lead to changes to plant communities bordering the infrastructure **beyond the 35-m protection zone, which is why an additional 15 m was considered in the calculation of the impacted plant area (see previous paragraph)**. On the other, the establishment infrastructure will isolate some wetlands areas and change the drainage pattern on the work site. Under these conditions, some wetlands could be subject to more or less significant changes, in particular partial dewatering in the periphery of drainage ditches. Note that building of a small clay berm along stripped areas will reduce the effect of this indirect impact. Monitoring of vegetation on the periphery of infrastructure during the first years will allow better evaluation of this anticipated impact. Details are presented in Chapter 10.

Low probability impacts

Besides direct encroachment on land, other sources of impact could affect vegetation and wetlands. The management of hazardous and waste materials could lead to accidental spills of hydrocarbons into the environment, mainly associated with refuelling or breakdown of machinery. Appropriate work practices will be put in place to prevent accidental spills, and should they occur, the contaminated soil will be managed in a manner consistent with existing regulations. Recycling and recovery of non-hazardous waste materials will be promoted during the construction phase. Therefore, the environmental risks related to spills are low and, if they occur, will be limited to the work site.

Also, machinery transportation and traffic on the work site could accidentally introduce or propagate invasive alien plant species (IAPS) within the territory. The rather rigorous climatic conditions in the study area will nonetheless limit the growth potential of some invasive species present mainly in the south of the province. Mitigation measures are planned to reduce the risks of introduction and propagation during construction and operation activities.

According to information gathered from Tallymen and their families (traplines RE2, VC33 and VC35) and other land users (Jamesian communities and the Eastmain Cree, see Chapter 5, Section 6.4.6 and Appendix G of the ESIA), the Tallymen's traditional use of local flora consists mainly of gathering blueberries and mushrooms. The list of plants for traditional use in Table 6-28 includes a large number of taxa and should be considered exhaustive since it includes more species than those confirmed for use during interviews with local community members. All of these species are abundant and common around the mine site and throughout the James Bay territory. Although individuals of these species will be lost during construction directly at the project site, they will remain present around the project site throughout the project.

IMPACT ASSESSMENT

The application of mitigation measures will minimize the potential impacts on vegetation and wetlands. However, despite the fact **that the species and wetlands identified are common and abundant throughout the area** and that the impacts will be reduced by optimizing the project at the early design stage, the areas affected will be significant. For these reasons, this impact is considered moderate. However, it is important to note that its extent is local, since deforestation will affect only the mine site **and a thin strip around the footprint**. The duration is medium since the impact may occur during the life of the mine, a period of approximately 20 years. Overall, the significance of the impact on vegetation and wetlands during the construction and operation phases is considered **moderate**.

Table 7-13 Area of terrestrial environments and wetlands directly affected by type of project infrastructure[1]

Type of infrastructure	Rocky outcrop (ha)	Human (ha)	Scrubland	Speckled alder	Dry stripped	Black spruce stand with lichen (ha)	Jack pine forest	Shrub peatland (ha)	Wooded peatland (ha)	Open peatland (ha)	Lake	Total per infrastructure
Waste rock stockpile	34.823		18.812			13.499		27.048	32.642	44.569	0.651	172.042
Overburden pile								11.458	21.026	18.233		50.717
Pit	11.545		16.423						0.350	22.777		51.095
Storage yard					3.063			0.089		0.591		3.743
ROMPAD					2.742							2.742
Industrial and administrative sector		0.055		0.784	6.691		0.939	0.983	0.967	4.709		15.128
Explosives storage facility								2.933		0.573		3.506
Water treatment plant								0.254	0.398			0.652
Ponds			3.931					13.264	13.479	4.231		34.904
Access	0.269		1.002		1.858	0.002		4.079	3.716	9.769		20.695
Total by natural environment	46.637	0.055	40.168	0.784	14.353	13.501	0.939	60.109	72.576	105.451	0.651	355.224

1 Areas do not include the 50 m indirect impact zone around the infrastructures because the areas are only related to the infrastructure footprint..

Table 7-14 Areas of terrestrial, wetland and water environments directly affected

Terrestrial environment	*Study area*	*Area directly affected (ha)*
Rocky outcrop (ha)	53.55	52.17
Human (ha)	43.52	0.86
Scrubland	241.64	53.00
Speckled alder	7.66	1.71
Dry stripped	21.40	17.56
Black spruce stand with lichen (ha)	114.61	18.12
Jack pine forest	15.51	1.61
Subtotal	***497.90***	***145.03***
Wetlands and water environments		
Shrub peatland (ha)	747.95	72.33
Wooded peatland (ha)	800.54	91.19
Open peatland (ha)	1326.52	140.69
Lake	67.03	0.65
Subtotal	***2942.04***	***304.87***
Total	**3439.94**	**449.90**

REHABILITATION PHASE

SOURCE OF IMPACT

- Transportation and traffic.
- Decommissioning of infrastructures.

MITIGATION MEASURES

Mitigation measures VEG 02, VEG 03 and VEG 06, QUA 01 to QUA 04, QUA 10 to QUA 12 should be applied, as well as standards NOR 02 to NOR 04 and NOR 10, described in Table 7-5 will be applied during the rehabilitation phase.

DESCRIPTION OF IMPACT

This phase includes the restoration of the site, including the **revegetation** of the various infrastructures. In short, the pits and other stripped surfaces will be revegetated in order to stabilize the site and allow for **the complete revegetation** of the site as quickly as possible.

Clay berms will need to be removed to re-establish connectivity between the restored environments and the surrounding natural environments.

Transportation and traffic will continue to be a potential vector for the introduction and propagation of invasive alien plant species. The application of mitigation measures will nonetheless reduce this risk to a negligible level.

IMPACT ASSESSMENT

The impact on vegetation during the closure phase is positive overall. As a result, an impact assessment is not required.

POST-REHABILITATION PHASE

After rehabilitation of the site, impacts will be nonexistent, since no mining activities likely to alter the quality of vegetation and wetlands will take place.

7.3.2 LARGE FAUNA

CONSTRUCTION AND OPERATION PHASES

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of process plant feed material, overburden and waste rock Hazardous and waste materials management.
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures SUR 01 to SUR 04 should minimize the areas affected, i.e. the footprint of required infrastructure (road, pits, stockpiles, basin, etc.). Overall, measures FAU 03, FAU 05, **FAU 08,** SON 01, CIR 01 to CIR 03, and LUM 01 to LUM 03 will help reduce disturbance of these **species likely to be present in the project area**.

If, despite the demonstration of the very low probability of caribou using the area, a caribou was observed near or in the project's area of influence, its presence would be reported to the person in charge of operations and the person in charge of the environment. The information would be validated and, if necessary, employees that may be in contact with the individual would be informed of the situation in order to increase their level of vigilance and limit the risk of disturbance or collision. The regional wildlife protection officers' office would also be notified. If the wildlife protection officers, in cooperation with Galaxy, determine that there is a risk to a caribou in the area of the mine or Billy-Diamond highway, Galaxy will propose adjustments to its operations to limit the risk of disturbance and collision until the risk is eliminated. For example, transporting the ore in convoys of several trucks to reduce the need for regular truck traffic. Furthermore, as soon as the authorizations are received, the proponent undertakes to create a joint working group (Galaxy, Eastmain and Waskaganish) to discuss any follow-up to be performed for this species. **The frequency of these meetings will be determined later with the participants. This species is also included in the general fauna monitoring described in Chapter 10.**

DESCRIPTION OF IMPACT

Two large mammal species are likely to frequent the mining project area: moose *(Alces alces americana*) and black bears *(Ursus americanus*). **Although the presence of woodland caribou (Rangifer tarandus caribou) is not likely, as described in section 6.3.2.1, the potential effects of the project on this species were also analyzed and documented in this section to validate the relevance of considering this species in the project impact assessment.**

The project will result in the loss of approximately 145 ha of terrestrial vegetation and 305 ha of wetlands during site preparation, and the construction and operation phases, including a 50-metre buffer area around the infrastructure, i.e. 35 m of planned deforestation and an additional 15 m of indirect impact. The project's main direct impacts on large fauna are habitat loss and fragmentation.

Woodland Caribou

Habitat loss and alteration

The study area is located in overlapping ranges of the Assinica population of woodland and migratory caribou of the Leaf River population (Couturier and et al., 2004). Woodland caribou are listed as a threatened species in Canada under the *Species at Risk Act*. They are also designated as vulnerable in Québec under the *Act respecting threatened or vulnerable species*. Since caribou, and more specifically woodland caribou, are a sensitive component of the natural environment, the study area for large fauna was defined primarily with this species in mind. However, no caribou were observed during the field survey, and data from radio collars did not show the mine area to be frequented by this species. Furthermore, subsequent forest fires have destroyed the vegetation. Return of this vegetation, and consequently of caribou habitat, is likely to take longer than the duration of the project **(section 6.3.2.1). With the expectation that fire-disturbed habitat will revert to suitable habitat within a few decades, the construction and operation of the mine will not result in any permanent destruction of existing or future habitat. As shown on Map 4-12, the waste rock stockpiles and tailings and all infrastructure are to be revegetated during the rehabilitation phase.**

The main threats to woodland caribou, identified in Chapter 4 of the *Woodland Caribou Recovery Strategy* and potentially related to the Galaxy project, are habitat alteration (loss, degradation or fragmentation) caused by human activities, and predation.

Fragmentation of caribou habitat caused by the project will be minimal, and concentrated in an area approximately 5 km in length. In total, the project will result in the loss of 340 ha of potential caribou habitat, including a 50-metre buffer area. The area of large-scale habitat affected by the project is approximately 127 ha, while potential calving, post-calving and rutting habitat is approximately 213 ha (Map 6-16A).

The habitats on either side of the infrastructures do not offer any exceptional conditions for caribou. The plant communities and biophysical conditions present in the area are widespread throughout the James Bay region. The environment in the project's area of influence is greatly disturbed by recent fires and/or the presence of existing infrastructures, in particular the Billy-Diamond highway, the truck stop and the hydropower transmission line. However, linear infrastructure, such as roads, can obstruct movement and fragment caribou habitat (St-Laurent et al., 2012). By obstructing movement, a road can lead to a loss of functional habitat, in addition to contributing to its fragmentation (Renaud et al., 2010). The effect of a road as an obstacle to caribou movement or the fragmentation of its functional habitat is proportional to the volume of traffic on it. Ultimately, Mahoney and Shaefer (2002) suggest that it is the construction of the road and its use by vehicles, rather than the physical structure itself, that would actually negatively impact caribou, especially during critical phases of their life cycle.

Therefore, the proximity of the proposed mine site to existing infrastructures (Billy-Diamond highway, power line, truck stop at km 381), which are sources of human activity, the small size of the proposed mine site, which allows caribou to easily go around the project site, and the low quality of the habitats within and around the zone of influence of the mine site, should minimize the effect of woodland caribou habitat fragmentation.

Predation

The increase in caribou predation due to deforestation and the presence of infrastructures such as access roads is associated with two phenomena: an increase in predator density and an improvement in their travel conditions. Deforestation by natural (fire) or anthropogenic (logging) causes in the boreal forest rejuvenates the forest landscape and promotes the development of hardwood species (leafing). These early stages of forest regeneration provide quality habitat for moose, which promotes an increase in their density, but in turn increases the density of their main predator, the grey wolf (Canis lupus). Consequently, the increase in wolf density increases predation pressure on woodland caribou, which are vulnerable to this predator. Deforestation also promotes the development of berry bushes, thereby also providing favourable conditions for an increase in black bear densities (Brodeur et al., 2008), another major predator of woodland caribou, primarily of fawns (Pinard et al., 2012). These effects of deforestation on habitat, and ultimately on wolf and black bear populations, are now recognized as a major cause of the decline in woodland caribou in North America, as predation has been identified as one of the main factors limiting caribou populations (Équipe de rétablissement du caribou forestier du Québec, 2013). This phenomenon has already been observed throughout most of the woodland caribou's range.

Studies also show that the probability of encounters between woodland caribou and wolves increases near linear structures. Authors mention that linear corridors, such as roads, allow wolves to travel at greater speeds and be more efficient in hunting, thereby increasing their predation pressure on large ungulates (Équipe de rétablissement du caribou forestier du Québec, 2013). At low densities of use, roads can sometimes serve as seasonal travel corridors, but their use ceases with the construction of major roads, such as paved highways, or when the potential for encounters with wolves and humans increases (Nellemann et al. 2000).

The mine infrastructure does not include linear features that allow predators to travel at higher speeds and improve hunting of large ungulates such as woodland caribou. In addition, the current intensity of human activity in the sector likely already deters wolves from frequenting this area, as it does for caribou. Thus, the current probability of encounters between woodland caribou and wolves is essentially zero in this area and the mining project will not significantly change this probability.

Collision and disturbance

The increase in traffic flow on the Billy-Diamond highway caused by the project will be slight (10-12 trucks per day), and the potential for caribou to be present on the highway is low (Map 6-17). Environment Canada's *Woodland Caribou Recovery Strategy* indicates that vehicle collisions are not nationally identified as a significant threat to woodland caribou (Environment Canada, 2012). Trucking related to the mine will occur during the daytime, which further reduces the risk of collisions. Caribou, like most large fauna species, are generally more active between dusk and dawn (Parks Canada, 2017) and most collisions occur during this period of reduced visibility (MTQ, 2010). Areas with the highest risk of collision with caribou will be identified by adequate signage. Furthermore, if caribou are observed in the project sectors, these observations will be recorded and may be sent to the MFFP so that they can be added to the current monitoring of the movements of radio-collared caribou. It will then be possible to identify whether one or more caribou are likely to be calving or wintering near the mine's area of influence. If so, exceptional measures will be agreed upon with the MFFP to mitigate the impacts on these caribou.

In addition to the impacts on caribou that may result from habitat alteration or predation, certain other activities may alter the natural behaviour of woodland caribou, in particular avoidance of the area. They could be affected by artificial lighting, noise, dust, and vibrations during blasting, and by human presence. To reduce these potential impacts, in particular, motorized equipment will be outfitted with high-performance mufflers in good condition to minimize noise disturbance. Blasting will be carried out during the day to minimize disturbance at night, while lighting will be limited to nighttime and installed in such a way as to prevent light from spreading out beyond the site. Light is not expected to have much of an impact on woodland caribou. To the best of our knowledge, there are no scientific studies that document the impact of light on woodland caribou. Chapter 4 of the "Woodland Caribou (*Rangifer tarandus caribou*) Recovery Strategy, Boreal Population, in Canada - 2012" identifies a low to medium level of concern for noise and light disturbance. The potential impacts of light will not extend beyond a 500-metre area of the mine, either from on-site lighting or lighting from ore transport trucks. Mitigation measures are planned to further reduce the potential impact of light. This also applies to dust emissions. No significant impact on woodland caribou is therefore expected. It should be noted that woodland caribou avoid man-made disturbances and that the likelihood of caribou being present in the study area or near the project footprint is very low. Current knowledge indicates that the species has used the study area very little over the past decade, be they woodland or migratory caribou. As a result, this sensitive component does not appear threatened by transportation, construction or operation activities, and therefore no impact on caribou is anticipated.

Moose and Black Bears

Moose, a common species in southern Québec, are very rare in the sector, with an estimated density of 0.5 moose/10 km² (Morin, 2015). As for black bears, the population density was estimated to be 0.2 bears/10 km² in 2003 (Lamontagne et al., 2006). However, disturbed environments, well represented by those undergoing regeneration following three fires, offer good habitat potential for black bears in the study area. The loss of habitat associated with the project footprint for these two species is therefore not significant.

However, as with caribou, the site preparation stage of the construction and operation phases **could result** in accidental death of these large fauna **species** through vehicle collisions. To minimize this risk, areas with the highest risk of collision with large fauna will be identified by adequate signage **(FAU 03). Movements of large fauna near the project's periphery could also be altered by artificial lighting, noise, dust and vibrations during blasting, and by human presence. To reduce potential noise impacts, motorized equipment will be outfitted with high-performance mufflers in good condition, and blasting will be carried out during the day to minimize disturbance at night. Mitigation measures are also planned to limit the impact of light on fauna.**

To avoid attracting **animals, including** black bears **and wolves**, with food resources or household waste, **measures are planned to prevent the accumulation of food waste, such as installing a covered compost bin. Fauna, including predatory species, will not be able to access waste materials because the waste containers will be covered (FAU 08). There are no plans to install fencing around the site where household waste will be managed. Waste materials that may attract animals will still be managed in such a way to prevent any animal from entering into the storage area. Furthermore, workers will be made aware of the importance of not feeding animals or leaving food lying about so as not to attract wildlife, especially bears, near work areas. Animals are not likely to be attracted to the site due to the noise and continuous activity. To ensure the safety of personnel, the site will be under constant surveillance and if an animal is seen on the site, appropriate measures will be taken to scare it off. Finally, waste materials will be sent off-site to a landfill in Amos.**

IMPACT ASSESSMENT

For all sources of impact identified during preparation, construction and operation, applying the mitigation measures proposed will help reduce the intensity, extent, duration and significance of the residual impact on **large fauna**. The intensity of the impact is therefore considered low. Its extent is local since the impact will essentially be limited to the mine site. The duration is considered medium, since the impact will extend over the life of the mine **on a continuous basis**. Overall, the significance of the impact on large fauna during the construction phase is therefore considered **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

As in the site preparation, infrastructure construction and operation phases, mitigation measures FAU 03 and FAU 05, SON 01, CIR 01 to CIR 03, and LUM 01 to LUM 03 should minimize the immediate impact of rehabilitation work on large fauna while limiting the footprint of infrastructure to be decommissioned and restored (pits, stockpiles, basin, etc.).

DESCRIPTION OF IMPACT

In light of the work involved, the impact of certain activities during the rehabilitation phase will be essentially the same as during the construction and operation phases. Therefore, some activities associated with rehabilitation work (artificial lighting, noise, dust, risk of spills, human presence, etc.) are likely to alter the natural behaviour of large fauna and their movements. Several preventive measures will nonetheless be implemented to minimize the impacts of rehabilitation work on large fauna.

IMPACT ASSESSMENT

For all sources of impact identified during rehabilitation, application of the mitigation measures proposed will help reduce the intensity, extent, duration and significance of the residual impact on large fauna. The intensity of the residual impact is therefore considered low. Its extent is local since the impact will essentially be limited to the mine site. The duration is considered short term since the impact will be limited to the duration of the rehabilitation work. Overall, the significance of the impact during the rehabilitation phase is considered **minor**.

POST-REHABILITATION PHASE

To the extent that restored habitats could be used quickly by the species generally associated with them, the side benefits of rehabilitation work potentially will be high for large fauna. This hypothesis is all the more plausible given that the estimated diversity and density of these species, prior to implementation of the project, was relatively low in the study area.

7.3.3 SMALL FAUNA AND HERPETOFAUNA

CONSTRUCTION AND OPERATION PHASES

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of process plant feed material, overburden and waste rock Water management.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures SUR 01 to SUR 04, QUA 01 to QUA 05, QUA 07 to QUA 13, AIR 01, AIR 02, LUM 01 to LUM 03, SON 01, VEG 01, VEG 02, FAU 02 and FAU 05 will have to be applied, as well as standards NOR 02 to NOR 05, NOR 08, NOR 09 and NOR 14, described in Table 7-5.

DESCRIPTION OF IMPACT

The construction and operation phases of the project are considered together, insofar as the nature of impacts on fauna will be essentially the same during these two phases. Indeed, outside of preparation and construction work, the pit and stockpiles will be created continuously during operation.

The different species of small fauna and herpetofauna whose presence was confirmed or is possible in the study area frequent a wide variety of terrestrial, wetland and aquatic habitats. During the site preparation step, and then the operation phase, the project will result in an overall loss of land and wetland habitats suitable for small fauna and herpetofauna of roughly **450** ha, **145** ha of which will be land vegetation and 305 ha wetlands. The total final impacts have been taken into consideration, **including a 50-metre buffer area around the mine infrastructure (35 m of direct loss and 15 m of potential loss due to edge effect).** For most small fauna species, the movement of individuals whose home range overlaps the infrastructure footprint will increase, at least temporarily, the density on the periphery of the study area, where similar habitats exist.

For small mammals and herpetofauna, whose ability to move is lower, it is probable that the development and construction work will lead to the death of individuals. These deaths should nonetheless be compensated rapidly by annual recruitment, given the high fertility that generally characterizes these fauna components. Species that prefer open areas will be better able to compensate for deaths in the areas cleared within the project footprint.

Potential impacts are also anticipated on water management. Several species of herpetofauna, as well as some small fauna, such as beavers, muskrats and river otters, live in wetlands or in water during one or more phases of their development. As a result, activities of the construction phase that change local hydrology, transport particulates or otherwise alter wetlands or aquatic environments could have an impact on these species. Several preventive measures will nonetheless be implemented to minimize impacts on wetlands and aquatic environments.

Risks of contamination of natural environments are also possible, mainly because of potential leakage of petroleum products or accidental spills from equipment. The impact of a potential spill will depend on, among other things, the volume of contaminants released, and whether the problem is a one-time incident (spill) or repeated (leak). In the event of a spill, the measures provided for in the emergency action plan will be implemented quickly, which will help to limit the extent of the contamination and prevent contamination of groundwater. Losses or spills of other products are generally one-time chance occurrences. The environmental monitoring activities will facilitate prevention and increase the effectiveness of intervention in the event of a spill. Some preventive measures will also reduce the risks of a major spill, such as the use of double-walled tanks.

Indirect impacts will also be associated with the disturbance of several species of small fauna and herpetofauna. In particular, disturbance will be caused by the heightened nighttime noise and lighting, and by increased dust and vibration during blasting. The effects will be felt mainly by species with small home ranges. Species that are more mobile will likely adapt their home ranges, when possible, by avoiding the work area footprint and/or by moving to favourable habitats located nearby.

Noise can have a negative effect on certain mammals (Shannon et al., 2015). In general, noise and human presence will temporarily limit the use of the work area and periphery by wildlife (avoidance). Feeding, reproduction and raising of young will also be disturbed for some species, depending on the period when these activities occur. The effects will be felt mainly by species with small home ranges. Motorized equipment will be outfitted with high-performance mufflers in good condition to minimize noise disturbance.

Several species, including the vast majority of anurans, are nocturnal, and increased nighttime lighting could have negative effects (disturbance of behaviour and circadian rhythm, increased risk of predation, avoidance, etc.). Nonetheless, some species are also predators, and the artificial lighting could, in these cases, heighten their feeding success. More light could also affect their behaviour and reproduction, which could have negative effects on the survival of these species. Furthermore, anurans are virtually immobile, for the most part, and depend on their respective habitats, wetlands in particular. It is therefore very difficult for these species to move and change habitats following an increase in nighttime lighting. This dependence on their habitat could compromise the survival of these species in the presence of artificial light. However, several mitigation measures, related to the extent, duration and type of lighting will be implemented to reduce this impact.

There will also be a risk of collision due to traffic on the construction site. Some small fauna species, such as foxes, could be attracted by food resources or household waste. To minimize this risk, workers will be made aware of the importance of not feeding animals or leaving food lying about so as not to attract wildlife, especially bears, near work areas. The impacts expected on small fauna and herpetofauna will be minimal due to the low population densities found in the study area during the 2017 field survey. Despite the potential presence of some species with a special status in the study area or near the project footprint, none appear to be significantly affected by the construction and operation activities.

IMPACT ASSESSMENT

Implementing mitigation measures will minimize the potential impacts on small fauna and herpetofauna during the construction and operation phases. Overall, the intensity of this residual impact is considered low. Its extent is local since the impact will essentially be limited to the mine site. The duration is medium, since the impact may occur during the life of the mine, a period of approximately 20 years. Therefore, the residual impact on small fauna and herpetofauna during the construction and operation phases is considered **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling.
- Water management.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

The mitigation measures SUR 02, SUR 03, QUA 01 to QUA 04, QUA 07 to QUA 13, AIR 01, AIR 02, LUM 01 to LUM 03, SON 01, VEG 02, FAU 01 and FAU 05 will have to be applied along with standards NOR 01 to NOR 05, NOR 08, NOR 09 and NOR 14, recorded in Table 7-5.

DESCRIPTION OF IMPACT

The impact of activities during rehabilitation will be essentially the same as that during the construction and operation phases, except that there will be no loss of habitat. Therefore, the risks of alteration of aquatic environments (hydrology, particulates) or of contamination of natural environments (leaks or spills) will be present, although minimized by the mitigation measures put in place. Indirect impacts will also be associated with the disturbance of some species of small fauna and herpetofauna (noise, lights, human presence), as will risks of collision associated with traffic on the site.

The impacts expected on small fauna and herpetofauna during the rehabilitation phase will be less significant than for most species, whose densities were already very low during the field surveys done in 2017 and which will tend to avoid areas where human activities will be concentrated in the preceding phases.

IMPACT ASSESSMENT

Application of mitigation measures will minimize the potential impacts on small fauna and herpetofauna. As a result, the intensity of this residual impact is considered low. Its extent is local since the impact will essentially be limited to the mine site. The duration will be short, since they will only be felt during the rehabilitation phase. Overall, the significance of the impact on small fauna and herpetofauna during the rehabilitation phase is therefore considered **minor**.

POST-REHABILITATION PHASE

After rehabilitation of the site, positive impacts on small fauna and herpetofauna are expected, since new natural habitats will be available.

7.3.4 ICHTHYOFAUNA

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Water management.
- Hazardous and waste materials management.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures **FAU 01,** SUR 01, SUR 03, SUR 04, QUA 01 to QUA 04 and QUA 07 to QUA 13 will have to be applied to limit the impact on ichthyofauna in the study area as well as standards NOR 02 to NOR 05, NOR 09, NOR 13 to NOR 16, described in Table 7-5.

DESCRIPTION OF IMPACT

During the construction phase, site preparation and infrastructure construction, water management, hazardous and waste materials management, transportation and traffic could have a negative effect on ichthyofauna.

Construction and site preparation activities, as well as circulation of machinery near watercourses and bodies of water, are likely to result in increased suspended solids in the water. Application of the aforementioned measures will limit this increase.

The culverts will be installed in accordance with NOR 05 and outside the periods defined by FAU 011, which will not have any permanent effects on this component. Only creek CE3 will be directly affected by culvert construction (Map 4.3). Other culverts or ditches will be present on the site and will serve to move contact and runoff water to the water management ponds. As these culverts are located on the contact water management route, they will not touch any natural watercourse. The location of these culverts and drainage ditches is identified on Map 4-10 (Chapter 4). The progressive development of dikes, road ditches and water retention ponds is likely to change the natural flow in the environment. This could lead to some modification of fish habitat.

In addition, during the work, there is a risk of accidental spills of petroleum hydrocarbons associated with use of the machinery. These risks are mainly related to refueling or breakdown of the machinery. Despite the implementation of preventive measures, **there is still** a risk of accidental spills during construction **but the risk** is low with application of these measures. Such a spill, if it occurred, would contaminate the **receiving environment** at the spill site. At this time, the actions defined in the emergency response plan would be implemented. If a significant volume is released, a portion of the product that has not adhered to the soil particles could migrate through surface runoff to water bodies and courses. Appropriate work practices will be put in place to prevent accidental spills, and should they occur, the contaminated soil will be managed in a manner consistent with existing regulations. The magnitude of the effect will depend on the nature of the product and its concentration. Environmental risks associated with spills are low and, if they do occur, will be limited to the work site.

A community sturgeon spawning ground project is planned at the intersection of Billy-Diamond highway and the Eastmain River, 10 km north of the site. This gave rise to certain concerns from land users as to its sustainability should the mining project be carried out. This project is currently awaiting funding. However, no impact is anticipated on the spawning ground, considering that the study area's drainage system only represents a very small percentage of the Eastmain River watershed (0.1% in total). In addition, during operation, runoff water will be collected and transported to retention ponds, and treated if necessary, before being discharged. Water quality will thus be ensured, and will be subject to a monitoring program.

IMPACT ASSESSMENT

Since only small areas will be affected by the construction work, and in light of the planned mitigation measures, only minor changes to the hydrological regime are anticipated. The intensity of the impact is therefore considered low. The extent will be site-specific since it will be in a small area where the construction work will be carried out near water and the duration will be short term as it will occur only during the construction phase. The significance of the impact on the hydrological regime during the construction phase is therefore **minor**.

1 Culvert layout plans will be provided to the IAAC when available at the detailed engineering stage.

OPERATION PHASE

SOURCES OF IMPACT

— Presence and operation of the pit.
— Water management.
— Hazardous and waste materials management.

MITIGATION MEASURES

Mitigation measures **FAU 01,** SUR 01, SUR 03, SUR 04, QUA 01 to QUA 04 and QUA 06 to QUA 13 will have to be applied to limit the impact on ichthyofauna in the study area as well as standards NOR 02 to NOR 09 and NOR 13 to NOR 16, described in Table 7-5.

DESCRIPTION OF IMPACT

During the operation phase, the presence of the pit, water management, and hazardous and waste materials management could have a negative effect on ichthyofauna. Throughout the operation of the mine, it will be necessary to accumulate contact water in water management **ponds**. This water will be pumped into creek CE2 after passing through the WTP**, is necessary**. **The location of the final effluent discharge point was determined based on watercourse homogeneity, inventory results, technical aspects (pipe length) and related costs.** The mine effluent will at minimum meet the criteria established by D019, the REMMMD and the EDOs. **The sanitary effluent, after treatment of wastewater from the buildings located in the industrial and administrative sector, will be discharged into creek EC4.**

As presented in sections 7.2.2 and 7.2.3, changes to the watersheds, flows and levels are anticipated. The lowering of the water table due to pit dewatering **could also** affect the watercourses in the study area. Table 7-**15** summarizes the anticipated changes for bodies of water and watercourses and their potential consequences on fish and fish habitat.

As in the construction phase, there is a risk of accidental spills of petroleum hydrocarbons associated with machinery use. Such a spill, if it occurred, would contaminate **the receiving environment**. At that time, the actions defined in the emergency response plan would be implemented. If a significant volume is released, a portion of the product that has not adhered to the soil particles could migrate through surface runoff to water bodies and courses. The magnitude of the effect will depend on the nature of the product and its concentration. Environmental risks have been addressed in the emergency response plan, and procedures will be established to minimize the extent.

Kapisikama Lake will gradually dry out as the pit expands. This lake has a population of yellow perch. **However, it is recognized that the habitat is not optimal for this species, as described in section 6.3.3.** A fish habitat compensation plan will be developed (NOR 16) to address this impact. **This plan could include relocation of fish from the lake to favourable habitat. The details of this plan have not yet been assessed. The compensation plan will also include a study of the initial state of the lake (diagnosis) as well as the yellow perch population. If relocation is preferred, the plan methodology will describe the research conducted to identify suitable relocation sites and the selection criteria used (e.g. isolated, unproductive headwater lake where no green newt, other sensitive amphibian populations or fragile ichthyological communities have been identified).**

IMPACT ASSESSMENT

In the operation phase, the impact on ichthyofauna is associated with changes in water quality, the drawdown of the water table, the encroachment of the infrastructure on the watercourse watersheds and the water returned to the environment from mining effluent. The intensity is considered low since the impact is not significant after application of the mitigation measures and dissipates quickly in the environment. The extent of the impact is considered **isolated** since it is felt **in specific sectors** of the study area. The duration of the impact is **long term** as the changes will be felt throughout the operation period **and beyond (Kapisikama Lake)**. In short, the significance of the residual impact on ichthyofauna is considered **minor**.

REHABILITATION AND POST-REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling Water management.
- Transportation and traffic.

MITIGATION MEASURES

Mitigation measures SUR 02 to SUR 04, QUA 01 to QUA 04 and QUA 07 to QUA 13 will have to be applied to limit the impact on ichthyofauna in the study area as well as standards NOR 01 to NOR 09, described in Table 7-5.

DESCRIPTION OF IMPACT

The rehabilitation phase involves decommissioning and returning the site to its original condition. During this phase, the dismantling of facilities and circulation of machinery near bodies of water and watercourses may alter the natural flow of surface waters from time to time. Removal of the roads and pumping stations may have the same effect on runoff, leading to an increase in suspended solids in the water. Application of the aforementioned measures will limit this increase.

Table 7-15 Project impact on water courses and bodies of water in the study area

Creeks / Bodies of water	Source of impact	Anticipated impact on the water environment	Effect on fish and their habitat
Lake Kapisikama	Decrease in watershed size and water table drawdown due to pit dewatering	Gradual drying up of the lake, **from the fourth year of the beginning of the work**	Loss of 12,220 m^2 of fish habitat.
CE1	No impact	N/A	N/A
Lake Asini Kasachipet	**No impact**	**N/A**	**N/A**
CE2	Presence of mining effluent and decrease in natural flow on a part of the watershed	Summer Increased flows Increase in average and low water levels Flood Increased flow Increase in level Increase in velocity Winter Decrease in average monthly and low flow Imperceptible effect on levels	No anticipated change in habitat functions. Increases in velocity should not cause erosion or morphological changes in the watercourse.
CE3	Decrease in natural flow on a part of the watershed	Decrease in average low and flood flows Slight decrease in levels between Lake Asini Kasachipet and in segments S1 and S2, which dissipates downstream	No anticipated change in habitat functions. Despite an expected decrease in flows (average and low) on **two segments**, these changes will result in only a slight decrease in levels.
CE4	Decrease in watershed size and water table drawdown due to pit dewatering	Decrease in all flows, **mainly** substantial for low flow Downstream of Billy-Diamond highway, a decrease in low water levels over the first 350 m. This decrease gradually dissipates after 1,500 m.	The decrease in level could lead to a loss of fish habitat during low water levels. However, due to the shape of the channel (U-shape), this decrease should cause only a small reduction in limited space.
CE5	Decrease in watershed size	Small decrease in flows producing imperceptible changes in level	No anticipated change in habitat functions.
CE6	Decrease in watershed size	Decrease in flows	Despite an expected decrease in flows, these changes will result in only a slight local decrease in levels. No anticipated change in habitat functions.
Note: Only the downstream portion of the Billy-Diamond highway culvert is considered a fish habitat on creek CE4.			

As in the other project phases, there is a risk of accidental spills of petroleum hydrocarbons associated with use of the machinery. As previously indicated, corrective actions and the proposed mitigation measures will limit the impact of such a spill.

Once the site is restored, the water management infrastructure will be dismantled on site (retention basin, WTP, effluent), allowing creeks CE2 and CE6 to return to their original watersheds in terms of surface area. The removal of the mine effluent will make it possible for creek CE2 to return to a natural flow regime. The pit will progressively fill with water from natural precipitation, creating a lake with an outflow toward creek CE3. There will therefore be permanent encroachment of the CE4 and CE5 watersheds. The CE3 watershed will permanently increase with the addition of the lake resulting from the pit flooding. However, no overflow is foreseen in the first 100 years, time needed to fill the pit. Decommissioning of the collection ditches at the foot of the stockpiles will also allow the watershed to return to a natural drainage scheme closer to the original pattern.

IMPACT ASSESSMENT

Since the affected areas are small compared to the surface **available**. The changes at close-out will be permanent. The intensity of the impact will be low, the extent will be limited and the duration will be long. The significance of the impact on ichthyofauna during the rehabilitation/post-rehabilitation phase is therefore **minor**.

7.3.5 AVIFAUNA

CONSTRUCTION AND OPERATION PHASES

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of process plant feed material, overburden and waste rock Water management.
- Transportation and traffic.

MITIGATION MEASURES

Some construction and infrastructure operations, in particular deforestation and soil stripping, are likely to affect birds. Mitigation measures SUR 01, SUR 02, SUR 03 and SUR 04 will help minimize the areas affected. During breeding season, measures FAU 02, **FAU 07,** SON 01, LUM 01 to LUM 03 will help reduce the risk of incidental take of birds, their eggs and their nests. Protective measures **FAU 06,** QUA 05, QUA 08, QUA 09, NOR 07 to NOR 09, NOR 13, NOR 14 and VEG 01 will help mitigate the potential effects of the work on waterfowl and other aquatic or shore birds. Finally, mitigation measures LUM 01 to LUM 03 will reduce the effect of lights on nocturnal migrants. The mitigation measures are described in Table 7-5.

DESCRIPTION OF IMPACT

The inventories presented in section 6.3.5 made it possible to establish the specific diversity of avian species found in the study area. The various habitats were divided into three categories: wetlands, open areas and softwood stands. The latter two categories are a part of terrestrial environments. The species diversity of these environments was 25 species in wetlands, 18 species in open areas and 14 species in softwood stands. These species, presented in chapter 6, correspond to the species potentially affected by the project.

Loss or degradation of habitat for common and special status species

Avifauna frequents a wide variety of terrestrial wetland and aquatic habitats in the study area. At the site preparation stage and during construction and operation, certain activities will contribute to a loss of approximately **450** ha of terrestrial and wetland habitats, i.e. 1**45** ha of terrestrial habitat and **305** ha of wetlands, despite the proposed mitigation measures, **including a 50-metre buffer area around the mining infrastructure. Furthermore, the targeted use of a borrow pit, outside the study area, is planned and could involve clearing land for its opening and operation. This clearing would result in a loss of habitat suitable for birdlife. The location of this potential borrow pit remains to be confirmed.**

It is also expected that the temporary loss of habitat associated with the project will be largely revegetated and restored at the end of the project, thus restoring habitat for avian fauna, albeit potentially different from the original habitat. For example, the flooded portion of the pit could become attractive to waterfowl, while certain portions of the stockpiles and exposed areas could be favourable to common nighthawk, and the steep slopes of the borrow pits could be favourable to bank swallows. In addition, the natural recovery of fire-affected habitats, in conjunction with mine operations, will contribute to a gradual increase in the potential of the study area for avian wildlife.

Potential impacts are also anticipated on water management. Several species of avifauna frequent aquatic or riparian environments during one or more phases of their development. Consequently, activities that alter the hydrology of watercourses, contribute to the migration of fine particulate matter or otherwise alter aquatic or wetland environments will affect these species. Various preventive measures will nevertheless be implemented to minimize the impact of the project on aquatic and wetland environments. **The various ponds (Map 4-1) could be used by avian fauna during operations. However, the use of these ponds will not be attractive, since they will be bordered by roads, and there will be no food sources for avian fauna. Furthermore, natural bodies of water will be available nearby and more attractive to fauna. Mitigation measures, such as scaring (FAU 06), will also help prevent avian fauna from using the ponds.**

Disturbance and accidental death

Site preparation, construction and operation activities could lead to incidental bird mortality through incidental take, i.e. injuring, killing or disturbing birds or destroying or disturbing their nests or eggs, especially during deforestation work. In addition to harming birds, nests or eggs, incidental take can have long-term consequences for bird populations due to the cumulative effect of many incidents. There will also be a risk of collision due to traffic on the construction sites.

In addition to the mortality that may result directly or indirectly from the preparation, construction and operation of the mine, these activities are likely to change the natural behaviour of birds and cause them to move to the periphery of the affected areas. Thus, for most of the bird species, the movement of individuals whose home range overlaps or borders the infrastructure right-of-way could increase, at least temporarily, densities on the periphery of the study area, where similar habitats exist. Despite the loss of natural environments, stripped soil, pit walls and stockpiles may be used by species that nest in open areas.

Birds within or near the project footprint could be disturbed by the artificial lighting. In particular, some nocturnal bird species may be negatively affected (e.g. disturbance in circadian rhythm and behaviour, increased risk of predation, avoidance). This artificial lighting could also cause nocturnal migrants to deviate from their flight path. In summer, however, some predatory species may benefit from this lighting to improve their feeding success. Mitigation measures addressing the extent, duration and type of lighting will be implemented to reduce this impact.

Noise, dust and vibration during blasting could also disturb some birds during breeding season, especially songbirds, which will have to adapt to changes in the sound environment. Motorized equipment will be outfitted with high-performance mufflers in good condition to minimize noise disturbance.

Special status species

Only the Rusty Blackbird as a special status species was observed during the 2017 surveys. It was only observed in wetlands at a density of 0.14 EC/ha. The Rusty Blackbird nests in open wetlands such as bogs, swamps, marshes and ponds (Avery 2020; Environment Canada 2014), which is consistent with several potential habitats found in the study area, primarily open bogs. On average, 35 nesting pairs of Rusty Blackbirds could be affected by the project, if all the wetlands inventoried are considered.

Finally, despite the potential presence of special status species in the study area or near the project footprint, none appear to be directly affected by the construction and operation of the mine. It should also be noted that the expected impact on avifauna in general will be lessened given the relatively low diversity and density of birds observed in the study area during the 2017 surveys. As well, all the previously proposed mitigation measures will help to significantly mitigate the project's impact on avifauna.

The potential effects of the project on species with special status in the study area, as well as their potential loss of habitat, are identified in Table 7-16.

Table 7-16 Potential Effects of the Project on Bird Species at Risk and of Special Concern Present and Potentially Present in the Study Area Based on Currently Recognized Threats

Species	Potential Effects of the Project
Short-eared owl	The project will result in the loss of 428.66 ha of habitat likely to support the nesting or presence of this species. However, the primary factor influencing local habitat choice in both summer and winter would be food abundance (COSEWIC 2008; ECCC 2018). As such, the density of small mammals is extremely low in the study area, which has been heavily disturbed by recent forest fires, suggesting that short-eared owls are unlikely to nest in the area in the short term, i.e. until the natural area and small mammal populations have recovered. The species was not detected during the project's inventories. Overall, the main threats to the species, including disturbance from human activity, habitat loss and alteration due to wetland drainage, urban expansion and intensive agriculture, increased nest predation due to habitat fragmentation, collisions with vehicles, utility cables and barbed wire fences, and the use of pesticides such as organochlorines (COSEWIC, 2008; ECCC, 2018), are absent or of low significance in the Project study area. Considering the low probability that short-eared owls will frequent the sector, and the planned mitigation measures (see section 7.3.5), the potential effects of the project on this species are considered insignificant.

Table 7-16 Potential Effects of the Project on Bird Species at Risk and of Special Concern Present and Potentially Present in the Study Area Based on Currently Recognized Threats (cont.)

Species	Potential Effects of the Project
Rusty Blackbird	The project will result in the loss of 304.22 ha of habitat likely to support the nesting or presence of this species. However, the biggest threats to the rusty blackbirds are the transformation of Mississippi Valley floodplain forests, where the species primarily winters, for agricultural or human habitation purposes (COSEWIC 2008). In addition, rusty blackbird populations are likely affected by crop pest control programs that have been ongoing in the south-eastern United States since the 1970s. Finally, degraded wetland quality and invasion of wetlands by dominant species, such as red-winged blackbirds, may also affect rusty blackbirds (COSEWIC 2008; Environment Canada 2015a). Although other habitat losses could occur on the breeding grounds due to activities such as wetland alteration and hydropower reservoir creation, overall, we consider the main threats to the species to be absent or of low significance in the project study area. Considering the planned mitigation measures, the potential effects of the project on this species are considered insignificant.
Common Nighthawk	The project will result in the loss of 353.83 ha of habitat likely to support the nesting or presence of this species. However, bare areas resulting from mine operations and tailings disposal could potentially contribute to increased nesting areas. No reasons have been identified for the decline in common nighthawk populations, but it may be partly related to the decline in insect populations that the species preys on (COSEWIC 2007a). Given the widespread declines observed in other insectivorous bird species, it is assumed that reduced food sources caused by widespread pesticide use has contributed to the decline. Habitat loss and modification, including reforestation of abandoned farmland and logged forests, fire control, intensive agriculture and the gradual reduction in the number of buildings with flat roofs covered with gravel in urban areas, may also have contributed to declines in some areas. Increased predation by domestic cats, striped skunks, raccoons, American crows and ravens may be contributing to the decline of the species, especially in urban areas. Other possible factors include motor vehicle collisions and climate change (COSEWIC 2007a; Environment Canada 2016a). Overall, the main threats to the species are absent or of low importance in the project study area. Consequently, considering the planned mitigation measures (see section 7.3.5), the potential effects of the project on this species are considered insignificant.
Olive-sided Flycatcher	The project will result in the loss of 324.59 ha of habitat likely to support the nesting or presence of this species. The species is most often associated with open areas that contain live trees or large snags that serve as perches, necessary for foraging (COSEWIC, 2007b). The causes of the decline in olive-sided flycatcher populations are thought to be related to habitat loss and alteration. Olive-sided flycatchers are generally associated with sparse vegetation cover, suggesting that they may respond positively to forest management activities such as timber harvesting. Recent studies suggest, however, that logged stands are less conducive to reproduction than stands that grow after a fire. Habitat alteration and loss in the areas where this migratory bird winters could also pose significant threats to these populations. Declining insect populations, either at breeding or wintering sites, may also be an important factor; other insect-feeding bird species in flight have shown similar declines (COSEWIC 2007b; Environment Canada 2016b). Overall, the recognized threats to the species are absent or of low importance in the project study area. However, although it is located at the northern boundary of the olive-sided flycatcher's nesting range, the habitat and forest fires in recent years would be favourable to the species, although it was not detected during the inventories carried out in 2012 and 2017. Considering the planned mitigation measures (see section 7.3.6), the potential effects of the project on this species are considered insignificant.

Table 7-16 Potential Effects of the Project on Bird Species at Risk and of Special Concern Present and Potentially Present in the Study Area Based on Currently Recognized Threats (cont.)

Species	Potential Effects of the Project
Bank Swallow	There is no habitat within the project footprint that would support the nesting or presence of this species. The Bank Swallow breeds in a wide variety of natural and man-made sites with vertical slopes, including riverbanks, cliffs along lakes and oceans, aggregate quarries, road cuts and soil piles. It seeks out substrates consisting of a mixture of sand and silt to dig its nesting burrows (COSEWIC, 2013). Although no single threat appears to be responsible for the decline of the Bank Swallow, the cumulative effects of several factors may be contributing to the decline. There is a clear loss of breeding and foraging habitat, especially from erosion and flood control projects (dams), aggregate management activities, conversion of pasture to cropland and deforestation (COSEWIC, 2013). Destruction of nests during aggregate excavation can also pose a significant threat in some areas. Climate change may reduce winter survival or reproductive potential, while widespread pesticide use may cause a decrease in the abundance or diversity of flying insects (COSEWIC, 2013). Threats during migration and on the wintering grounds are largely unknown, but knowledge of these threats may be essential understand the decline of the species. Regionally, the large James Bay reservoirs may have destroyed previously used nesting sites. Steep riverbanks and sandbanks, such as quarries and borrow pits excavated for road and dike construction, however offer an abundance of potential nesting sites. Overall, the main threats to the species are absent or of low importance in the project study area. It should also be noted that the species was not detected during the surveys conducted in the study area in 2012 and 2017. Therefore, the potential effects of the project on this species are considered insignificant.

IMPACT ASSESSMENT

For all sources of identified effects on **common and special status** birds during construction and operation, the application of the proposed mitigation measures will help reduce the intensity, extent, duration and significance of the impact. The intensity of the impact is therefore considered low. Its extent is local since the impact will essentially be limited to the mine site. The duration is considered medium-term, since the impact will extend over the life of the mine **and a restoration effort to regenerate the habitat over several lost areas**. Overall, the significance of the impact during the construction and operation phases is considered **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

— Infrastructure dismantling Transportation and traffic.

MITIGATION MEASURES

Mitigation measures SUR 01, SUR 02, SUR 03 and NOR 01 should minimize the impact of the rehabilitation work, while limiting it to the infrastructure to be dismantled and restored (pits, stockpiles, basin, etc.). Measures FAU 02, SON 01 and LUM 01 to LUM 03 will also help reduce the risk of incidental take of birds, their eggs and their nests. Measures QUA 07, QUA 08, NOR 14 and VEG 01 will help mitigate the potential effects of the work on waterfowl and other aquatic or shore birds. The mitigation measures are described in Table 7-5.

DESCRIPTION OF IMPACT

Considering the work involved, the impact of rehabilitation activities will be essentially the same as during construction and operation. Thus, some of the activities associated with rehabilitation work (artificial lighting, noise, dust, risk of spills, etc.) are likely to disturb the natural behaviour of birds and temporarily cause them to move to the periphery of the affected areas. Various preventive measures will nevertheless be implemented to minimize the impact of the rehabilitation work on the terrestrial, wetland and aquatic environments.

IMPACT ASSESSMENT

For all sources of identified impacts during rehabilitation, the application of the proposed mitigation measures will help reduce the intensity, extent, duration and impact of the residual impact on birds. The intensity of the residual impact is therefore considered low. Its extent is local since the impact will essentially be limited to the mine site. The duration is considered short term since the impact will be limited to the duration of the rehabilitation work. Overall, the significance of the impact during the rehabilitation phase is considered **minor**.

POST-REHABILITATION PHASE

Since restored habitats can quickly be used by the species generally associated with them, we consider that the expected benefits of the rehabilitation work could be high for birds. This assumption is all the more plausible since bird diversity and density before the project were relatively low in the study area. **For example, in the post-restoration period, the flooded portion of the pit could become attractive to waterfowl, while certain portions of the stockpiles and areas exposed during construction could be favourable to common nighthawk, and the steep slopes of the borrow pits could be favourable to bank swallows.**

Table 7-17 presents, for each of the at-risk avian species potentially present, the main predicted effects of the activities carried out during the construction, operation and closure / restoration phases with regard to the habitats of these species. The preferred habitats available in the study area for each of these species are presented in tableau 6-57 (chapitre 6).

SUMMARY OF KEY EFFECTS ON HABITAT FOR AT-RISK BIRDS

Table 7-17 Main Effects of the Project on Nesting Habitat for At-Risk Birds

Species	Phase		
	Construction	Operation	Close-out / Restoration
Common Nighthawk	Loss or alteration of habitat	Loss or alteration of habitat Likely habitat creation	Likely habitat creation
Short-eared owl	Loss or alteration of habitat	Loss or alteration of habitat	Potential habitat creation
Bank Swallow	Loss or alteration of habitat	Loss or alteration of habitat Potential habitat creation	Potential habitat creation
Olive-sided Flycatcher	Loss or alteration of habitat	Loss or alteration of habitat Potential habitat creation	Potential habitat creation
Rusty Blackbird	Loss or alteration of habitat	Loss or alteration of habitat	Potential habitat creation

7.3.6 BATS

CONSTRUCTION AND OPERATION PHASES

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Presence and operation of the pit.
- Other infrastructure in operation.
- Management of process plant feed material, overburden and waste rock Transportation and traffic.

MITIGATION MEASURES

In order to minimize the residual impact of the sources identified during the construction and operation phases, mitigation measures SUR 01, SUR 02, AIR 02, SON 01, VEG 02, FAU 02 and FAU 04 as well as standards NOR 07 to NOR 09 and NOR 13, described in Table 7-5, will be applied.

DESCRIPTION OF IMPACT

The surveys identified three species of arboreal bats in the study area (Tremblay and Jutras, 2010). As mentioned earlier (section 6.3.1), the study site has been greatly affected by several forest fires in the recent past. Consequently, there is little or no tree stratum in several parts of the study area (rocky outcrops, scrubland, alder, burns, stripped zones, open peatlands and treed peatland), **which significantly reduces the potential for the presence of quality roosts and maternity colonies. The very low frequency of use of the site by bats of the genus Myotis, highlighted during the inventory carried out in 2017 (see section 6.3.6.2), is also a testament to the poor quality of the habitats present in relation to the needs of these species.** Still, the wooded peatland and spruce-lichen stands show some potential for daytime roosts. However, it is limited due to the small diameter of the black spruce. Consequently, deforestation and other activities related to the construction of work and storage areas will result in a direct and indirect loss of **110.92 ha of habitat for these two types of environments. This loss of habitat therefore represents the main source of impact of the project for chiropteran species.**

It should be noted that there are many alternative habitats of equal or greater quality across the regional landscape for daytime roosts, maternity and feeding sites. Thus, the loss of these environments will likely result in a displacement of the populations of these species to alternative sites. According to the recovery strategy for the little brown myotis, northern myotis and tricoloured bat (EC, 2015), loss of habitat is one of the biggest threats, second only to white-nose syndrome, which has largely decimated these species in Québec. This loss of habitat could cause bat mortality if arboreal bats are present during deforestation activities. However, considering the mitigation measures applied and the sparse population observed during the 2017 survey, this risk is minimal.

Wetlands are usually considered key habitats to meet the food needs of bats as they typically contain a large quantity of prey (Grindal et al. 1999). In all, **305** ha of wetlands will be directly affected by the project. The loss of these sites could lead to increased movement to alternative feeding sites. However, it should be mentioned that peatland, which makes up all of the affected wetlands, is generally not the preferred feeding sites of bats. Free water surfaces are not common in wetlands and their acidity is not conducive to the production of large quantities of insects.

Changes in the habitat structure could also affect the bats' use of the environment. However, this impact is more difficult to characterize and quantify since numerous factors are involved and their effects vary by species. For example, forest fragmentation can lead to the creation of linear features that will be used by certain species (EC, 2015). Bats generally use linear forest structures to guide their movements (Grindal and Brigham, 1998; Henderson and Broders, 2008). Forest edges along the cuts, as well as road rights-of-way and other linear features are therefore potential corridors for movement. The effects of habitat fragmentation appear to vary by species and by the nature and extent of the fragmentation itself (Ethier and Fahrig, 2011; Segers and Broders, 2014). It is, however, clear that changes to the habitat structure could change the use of the area by bats.

Activities that cause noise, vibration and dust, such as earthwork, excavation, transportation and construction, could disturb the local bat population. Since bats use echolocation during their movements and to catch prey, anthropogenic noise, particularly at high frequencies, could interfere with these activities. The impact of this type of disturbance varies by species since each one uses its own echolocation frequency range (Bunkley et al., 2015). The noise generated by road traffic covering a frequency band of up to 50 kHz but mostly between 1Hz and 20 kHz (Schaub et al., 2008) will probably cause more disturbance in species using relatively low echolocation frequencies. For this project, the species using such frequencies are the hoary bat and the big brown bat. In terms of daytime roosts, noise could also affect the bats by disturbing their sleep. Consequently, in the vicinity of the infrastructure, the quality of roosts for local populations may decrease and sites may even disappear, causing individuals to move to similar habitats in the surrounding area.

Similarly, vibrations caused by certain activities close to key habitats such as maternity colonies could lead to reduced reproductive success, causing the bats to leave the area in search of other sites (EC, 2015; McCracken, 2011). That said, no maternity colonies were found on the project site and the likelihood of their presence is low. This is because, depending on the species, bat maternity colonies are found in large-diameter snags, buildings or rock faces. In light of the forest fires and nature of the plant communities present in the project footprint, few snags are suitable for maternity colonies. And although there are rock faces in some sectors, they are rarely frequented by bats and are therefore unlikely to be used to form maternity colonies. The construction of new buildings could, depending on their configuration and accessibility for bats, result in the creation of roosts (daytime, hibernacula or maternity).

Since bats are nocturnal, they are more likely to be disturbed by artificial light (Stone et al., 2015). In particular, it seems that the presence of artificial light would disturb the movements of some species (Stone et al., 2009) and could lead them to less than optimal flight paths. These alternative flight paths could require them to expend more energy and make them more vulnerable to predators (Stone et al., 2015). However, it is difficult to assess the real effect for this project as the impact of a change in flight path varies depending on the surrounding environment. Some bat species such as the big brown bat and bats of the genus Myotis often use artificial light sources for feeding purposes, as they attract a large number of flying insects (Rydell, 1992; Stone et al., 2015).

In short, since the current environment is not favourable to these animals (greatly disturbed by forest fires) and the low population density observed during the 2017 surveys, the residual impact of the mine construction and operation will be minimized. **Table 7-18 summarizes the potential effects on special-status bat species. Considering the very low frequency of use of the site by bats of the genus Myotis, the poor quality of the available habitats and the planned mitigation measures, the potential effects of the project on the populations of little brown bats and northern bats are considered insignificant.**

Table 7-18 Potential Effects of the Project on Bat Species at Risk and of Special Concern Present and Potentially Present in the Study Area

Little brown bat Northern bat	110.92 ha of habitat likely to provide daytime roosting and/or maternity habitat for these species will be lost as a result of the project. According to the recovery strategy for little brown bats and northern bats (Environment Canada, 2015b), habitat loss is the biggest threat to these species, after white-nose syndrome. This loss of habitat therefore represents the main source of impact of the project for these two species. However, the potential for the presence of quality roosts and maternity sites is limited, given the recent forest fires and the reduced diameter of the trees on the study site. The very low frequency of use of the site by bats of the genus *Myotis*, highlighted during the inventory carried out in 2017 (see section 6.3.6.2), is also a testament to the poor quality of the habitats present in relation to the needs of these species. It should be noted that there are many alternative habitats of equal or greater quality across the regional landscape for daytime roosts, maternity and feeding sites. Thus, the loss of these environments will likely result in a displacement of the populations of these species to alternative sites. Considering the very low frequency of use of the site by bats of the genus *Myotis*, the poor quality of the available habitats and the planned mitigation measures, the potential effects of the project on the populations of little brown bats and northern bats are considered insignificant.

IMPACT ASSESSMENT

In light of the mitigation measures, the generally unfavourable environment for bats and their presence in small numbers, the residual impact of the project during construction and operation is considered low, even considering the special status of the horary bat and bats of the genus *Myotis.* Since the effects of the project are largely confined to the mine site, the extent of the impact is considered local. The duration of the impact is considered medium term as most of the issues will only be present during the mine's useful life. Consequently, the significance of the residual impact on bats during the construction and operation phases is considered **minor.**

REHABILITATION PHASE

SOURCES OF IMPACT

— Infrastructure dismantling Transportation and traffic.

MITIGATION MEASURES

In order to minimize the residual impact of the project during the rehabilitation phase, mitigation measures SUR 02, AIR 02, SON 01, VEG 02 and FAU 04, described in Table 7-5, will be applied.

DESCRIPTION OF IMPACT

Unlike the construction and operation phases, no loss of natural habitat will occur during the rehabilitation phase. When mining projects are involved, loss of habitat usually has the greatest impact on bats. Similar to the construction and operation phases, disturbances associated with vibrations, noise and light will occur during this phase. However, the application of mitigation measures will minimize their impact.

Nevertheless, buildings installed during the mine activities could possibly be used as roosting sites by bats (daytime roosting and/or maternity and/or hibernacula). For this reason, before any building or installation is dismantled, it must be inspected to check whether the site is used by bats (FAU 04). If necessary, steps will be taken to minimize the impact of any such demolition. Consequently, the demolition of buildings will have no residual impact.

IMPACT ASSESSMENT

For the same reasons as for the construction and operation phases, the intensity of the project's impact during the rehabilitation phase is considered low as no loss of habitat is anticipated. The extent of the impact is local since the effects will only be felt at the mine site. The duration of this impact will be short term as it will not continue past this phase. Hence, the significance of the impact on bats during the rehabilitation phase is **minor**.

POST-REHABILITATION PHASE

Over time, the impact of the project during this phase will be positive for bats as they are expected to return to new natural habitats.

7.3.7 COMPARISON OF IMPACTS ON THE BIOLOGICAL ENVIRONMENT 2018 VS. 2021

This section is intended to summarize the changes to the current description and assessment of impacts compared to those described in the 2018 EIA. Table 7-19 lists the components of the biological environment in the study area and, based on the project phases, indicates the changes made to the description and assessment of impacts based on the 2018 and 2021 projects, if applicable.

Table 7-19 Comparison of the description and assessment of the impact of the project on each of the biological components of the local study area

Component	Phase	Change to the description of the impact	Impact significance according to the 2018 project	Impact significance according to the 2021 project
Vegetation and wetlands	Construction and operation	– *Carex sterilis* is no longer considered a flora species of special status – The area related to the loss of vegetation and wetlands is similar	Moderate	Moderate
Large fauna	Construction and operation	– Improvement of the description of impacts on caribou – Update of affected habitat areas with new 50-metre buffer area around infrastructure – Addition of mitigation measure FAU08	Minor	Minor
Large fauna	Rehabilitation	-	Minor	Minor
Small fauna and herpetofauna	Construction and operation	– Update of affected habitat areas	Minor	Minor
Small fauna and herpetofauna	Rehabilitation	-	Minor	Minor
Ichthyofauna	Construction	– Improvement of the impacts of the construction of ditches and culverts – Impact assessment of the sturgeon spawning ground project – Addition of FAU01 to the mitigation measures	Minor	Minor
Ichthyofauna	Operation	– Details of the impacts of the drying up of Kapisikama Lake and mitigation measures – Addition of FAU01 to the mitigation measures	Minor	Minor
Ichthyofauna	Rehabilitation	-	Minor	Minor

Table 7-19 Comparison of the description and assessment of the impact of the project on each of the biological components of the local study area (cont.)

Component	Phase	Change to the description of the impact	Impact significance according to the 2018 project	Impact significance according to the 2021 project
Avifauna	Construction and operation	Update of affected habitat areas Impacts of the use of water management ponds Impacts on status bird species Addition of mitigation measures FAU 06 and FAU 07	Minor	Minor
Avifauna	Rehabilitation and post-rehabilitation	Use of ponds Impacts of rehabilitation on the habitats of status species	Minor	Minor
Bats	Construction and operation	Update of affected habitat areas Impacts on status species	Minor	Minor
Bats	Rehabilitation	-	Minor	Minor

7.4 IMPACT ON THE SOCIAL ENVIRONMENT

7.4.1 CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES

Impacts on the current use of land and resources for traditional purposes were analyzed in two specific areas: the project study area and the area along the Billy-Diamond highway (between the project and Matagami) in order to distinguish between impacts related to the transportation of ore concentrate from the project site to Matagami via the Billy-Diamond highway and impacts related to transportation and traffic on the mine site.

7.4.1.1 ***STUDY AREA***

CONSTRUCTION PHASE

- Site preparation and infrastructure construction.
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures UTT 01 to UTT **06**, CIR 01, CIR 02, CIR 04, **CIR 07, CIR 16 and VIE 05** will have to be applied, in addition to nuisance reduction measures AIR 01 to AIR 05, SON 01, LUM 01 to LUM 03, and VIB 01 to VIB 04. These are set out in Table 7-5.

DESCRIPTION OF IMPACT

The traditional activities of Cree users on the territory of the study area could be disrupted during the construction phase. According to consultations with **land users and members of the Cree First Nations**, several large animal species are hunted in the study area, particularly **moose, black bear and caribou. Small game and furbearer species are also hunted (porcupine, lynx, fox, beaver, marten, otter, muskrat), as** are waterfowl. Fishing, trapping, and snaring (hare, etc.) are also practised and could be affected by the species temporarily avoiding or abandoning the area. **Although their traditional harvesting activities may be impacted by the construction, it was nonetheless difficult for users to fully assess the extent of the project's impacts. It should be noted that the study area also includes areas valued by land users because of the quality of the sites, abundance of certain resources, or strong generational ties and attachment to the land.**

Land users say they are concerned about noise, vibrations and air pollution that could be harmful to wildlife and vegetation, which have been regenerating since the forest fire in 2013. On the one hand, noise would disturb wildlife, which might abandon the area. As such, trapping, moose hunting and small game hunting, which usually take place within a certain radius of the mine project site, may have to be relocated. Finding new traplines and small game hunting sites may require users to invest both time and travel costs. On the other hand, according to the land users, pollution from mining activities could affect the fauna and flora, and therefore the health of users who consume them. Such users will then prefer to move to another area to carry out harvesting activities in an area protected from industrial activities. However, they point out that animals move about and that they are still likely to find animals with a poorer quality meat within a fairly wide radius.

The loss of trapping and small game hunting space could be temporarily mitigated by the probable increase in population density around the mine site. In fact, for most bird species, the movement of individuals whose home range overlaps or borders the infrastructure footprint could, at least temporarily, increase in density on the edge of the study area, where similar habitats exist (section 7.3.3).

For waterfowl and goose hunting specifically, users mention that the noise and odours from the mine could drive geese away and could even affect their migratory route. The fear is that geese will avoid the areas where hunting is usually done. In this case, users will have to move to other areas, which could involve searching for new hunting sites and investing time and money in travel, as well as unsuccessful transitional hunting seasons. However, some users think that geese would not be disturbed too much by the noise and do not feel that they would need to change hunting locations. Some users mention that geese may feed on vegetation contaminated by particles from the mine that are carried by snow and absorbed by plants, or contaminated by pollution that may accumulate in the soil. These users would be reluctant to feed on geese that lived within a certain radius of the mine.

Concerning migratory caribou, users mentioned that their numbers are decreasing and that sightings of them in the area have been rare since the 2013 forest fire. They do not mention any particular impacts related to the mine's activities. According to one land user, woodland caribou should not be particularly affected, since their range is located to the south of the study area boundary and they do not travel northward. No one brought up any effects the project might have on migratory caribou during the consultations.

The construction could also lead to the loss of use of portions of the territory **and areas** where the mining infrastructure will be located **which are valued** for such traditional activities as berry picking and beaver trapping, although other areas far from the project's sphere of influence are also conducive to these activities on the RE2 trapline. The tranquility of the area, especially the Cree camps located around the mining site itself, could also be affected by mine construction activities. People who are used to performing traditional activities in the projected infrastructure sector could find their safety compromised by the site's new use. **Furthermore, the periods during which such traditional activities are practised could be impacted by the construction schedule.** To allow them to adapt their practices to these new conditions, land users will be informed before the work begins and of its progress. Galaxy will ensure that construction workers are made aware of the Crees' traditional way of life and their practices on the territory. **In addition, a schedule of the main traditional activities will be drawn up with representatives of the Cree Nation of Eastmain, and construction shutdown times will be scheduled according to these activities.**

The presence of new roads for access to the site, facilities and explosives depot will not result in any significant change to access to the territory since these roads will not be accessible to land users. In addition, disturbances associated with increased traffic on the Billy-Diamond highway will be mitigated by a traffic management plan that will include the installation of signage indicating the site and requiring compliance with speed limits. In addition, for security reasons, prior to the start of work, an exclusion zone for traditional activities will also be established near the mine site, in collaboration with the RE2 trapline Tallyman. **Furthermore, a fire strip barrier will surround the project site, which will also serve to limit access. The tallyman and his family will be able to manage this fire strip barrier to ensure their safety.**

The site's high-risk facilities will also be secured by a fence installed around the industrial and administrative sector, which includes the ore stockpile, concentrator, mechanical workshop and warehouses, as well as the administrative buildings and the camp. Fences will also surround the tanks and generators. Finally, there will be a fence around the explosives depot. Other measures to restrict access to the site and to the household waste disposal infrastructure are planned. Household waste will be sorted and then sent to composting (the composter will be located in a container), or managed by a specialized company that will take care of recycling or landfilling off-site. Waste that may attract animals will be managed in such a way as to avoid any animal intrusion into the area reserved for this purpose. In the event that an intrusion occurs, scaring techniques will be implemented or, if necessary, the tallyman will be called in to implement appropriate measures that will be determined according to the situation.

Users also fear accidental spills and water pollution, which could disrupt or interrupt their fishing activities, especially on the Eastmain River. They mention that the study area has always been attractive to beaver populations, although it is taking time for this resource to be re-established after a forest fire. Users are concerned that regenerating vegetation may be contaminated or that water may be polluted by spills and that this may seriously disrupt the resource. Trapping activities would then be reduced. Several mitigation measures will be implemented to limit the risk of an accidental petroleum hydrocarbon spill, particularly in the emergency response plan. Procedures will be established to prevent spills and limit their impact (Chapter 9).

The assessment of ecotoxicological risks to human health performed by Sanexen (2018) considers traditional activities as an exposure scenario and concludes that the risks to the population are negligible for all exposure scenarios. All substances likely to be released into the air by the mining operations were considered in the risk assessment. The information available at the time of writing up the study did not identify or rule out additional substances that might be released in aqueous discharges from the mine.

Human receptors make little to no direct use of creeks CE2 and CE4 into which mining and sanitary wastewater will be discharged.

Some activities at the mine site raise questions because they are new, temporary, ad-hoc or exceptional, regardless of the phase. Means of communication will be set up to respond **to issues** efficiently and thus reduce their intensity. Communications will be encouraged through various means: the **Galaxy website, newsletters, monitoring and oversight committees, a Cree liaison officer, and other means. Committee members will also be invited to share the information they receive with community members. Lastly, Galaxy will set up a system for receiving and processing complaints before construction begins, which will continue until closure. It will be able to handle complaints from land users, if any arise. A report on the nature of complaints received by Galaxy, and the manner in which Galaxy handled them, will be presented to the members of the monitoring committee at each meeting.**

As for recreational water quality, no significant change is anticipated in human health. In addition, no anticipated change is likely to affect navigation on the navigable waterways in the study area, either on the Eastmain and Miskimata rivers, or on the lakes near Lake Amisk Matawaw. As for creek CE5, which is little navigated by users, the anticipated changes will not be significant enough to affect navigation.

IMPACT ASSESSMENT

For all the reasons mentioned above, the intensity of this impact is considered moderate since the project will cause disturbances on the territory despite the mitigation measures planned to reduce the potential negative effects. The extent of the expected residual effects is local since the effects are likely to be felt by land users who frequent the study area, i.e. the RE2 trapline tallyman's family. The duration will be short term. Thus, the significance of the impact on land use during the construction phase is considered **moderate, although some Cree users of the mine site area may perceive it to be greater.**

OPERATION PHASE

SOURCES OF IMPACT

- Presence and operation of the pit.
- Other infrastructure and equipment in operation.
- Management of process plant feed material, overburden and waste rock Water management.
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures UTT 01 to UTT **06**, CIR 01, CIR 02 and CIR 04, **CIR 07, CIR 16 and VIE 05** will have to be applied, in addition to nuisance reduction measures AIR 01 to AIR 05, SON 01, LUM 01 to LUM 03, and VIB 01 to VIB 04. These are set out in Table 7-5.

DESCRIPTION OF IMPACT

Traffic on the road network, noise, vibration and mine activities could disturb some wildlife species of interest near the mine site and road infrastructure, causing them to move to quieter sectors. **Users of RE2, VC35 and VC33 mentioned that odours could also have a repellent effect on geese.** Hunters and trappers may therefore have to change their practices and move as well.

Furthermore, the peacefulness of the area, particularly on the periphery of the mine site, could diminish because of the operations, as could the Cree users' sense of safety when engaging in traditional activities in the sector. **Although an increase in noise levels during construction and operation will be noticeable in the vicinity of the project (particularly at the on-site worker camp and truck stop) compared to the current situation, it will remain below the permissible noise limits of 45 dBA. Thus, for the Cree encampments, which are farther from the project site (i.e., located at distances ranging from 5.4 km to 11.4 km as the crow flies from the project site), the noise impact of the increase in noise levels related to operations would be insignificant (WSP, 2021c).**

In addition, as mentioned during the 2017-2018 consultation, their perception of the quality and taste of the wildlife hunted on the land near the mine could be affected, leading them to lose interest in this portion of their trapline (Chapter 5). **Also, water is an element that is highly valued by the First Nations because of its vital importance on and for the territory. Users fear that regular mine operations may result in water pollution due to mining effluent and due to precipitation and water runoff from the mine site. For this reason, the mine effluent (which also includes the mine site runoff that will be collected and pumped into the water management basin) discharged into CE2, as well as sanitary wastewater discharged into CE4, will be treated as necessary prior to being discharged into the environment and water quality will be monitored.**

In focus groups, elders and youth indicated that working at the mine could interfere with traditional Cree activities and could deprive youth of broader exposure to traditional Cree culture. Galaxy will implement measures to encourage the practice of traditional activities for its Cree workers and will include a fund in the IBA to support initiatives to pass traditional knowledge from one generation to another.

Concerns about use of the land by non-indigenous people were also raised. In this respect, just like in the construction phase, hunting, **trapping and** fishing will be prohibited both for workers housed at the Galaxy worker camp **and for contractors**. **These restrictions will be included in contractor service contracts and employee employment contracts. It should be noted that mine workers' typical rotating schedule does not encourage these activities since workers work long hours every day (12 hours per day) and they do not have any time off during their work stay.**

Firearms and fishing equipment will not be permitted on chartered flights used by workers travelling to the mine by air, which will be the case for the majority of workers. Employees travelling to the mine by road will be required to stop at the mine entrance to identify themselves and declare that they are not carrying any hunting or fishing equipment. All incoming and outgoing vehicles will be systematically searched, as on most industrial sites.

Disciplinary measures will be imposed on employees and subcontractors who do not comply with the clauses of their contracts. The importance of complying with regulations on hunting, fishing and trapping on the territory will also be discussed during employee orientation days. If employees wish to visit an outfitter on their days off, they will be responsible for obtaining the necessary permits in accordance with the regulations in effect. In addition, if employees ask to do specific fishing activities, a plan could potentially be developed.

It should be noted that the employment or business income of Cree workers associated with the project could be partly allocated to the practice of traditional activities such as hunting, fishing and trapping. During the Eastmain1A−Rupert project, it was found that the increase in income among the Cree population was used to pay for the costs associated with more stays in the territory (Hydro-Québec Production, 2015). Consequently, for the Cree communities, the project could lead to increased land use and the practice of traditional activities for Cree workers hired at the mine. **According to the INSPQ (2014), an increase in income among younger workers may encourage them to acquire hunting and fishing equipment and may increase their participation in traditional activities.**

IMPACT ASSESSMENT

The application of mitigation measures will minimize the potential impact on land use during the operation phase. Overall, the intensity of this impact is considered moderate. The extent of the expected residual effects is local since the effects are likely to be felt by Cree land users who frequent the study area, i.e. the family of the RE2 trapline tallyman. The duration is medium-term since the impact may persist throughout the operation phase. Overall, the significance of the impact on land use during the operation phase is considered **moderate, although Cree users of the mine site area may perceive it to be greater.**

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructure dismantling Water management.
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures UTT01 to UTT04, CIR01, CIR02 and CIR04 will have to be applied as well as disturbance reduction measures AIR 01 to AIR 05, SON 01, LUM 01 to LUM 03, and VIB 01 to VIB 04. These are described in Table 7-5.

DESCRIPTION OF IMPACT

The effects of mine rehabilitation activities will be similar to those of the construction and operation phases but the duration will be shorter: temporary disruption of Cree users' traditional activities, peacefulness of the site, diminished sense of safety.

The restoration plan was discussed with the RE2 tallyman and his family. A video showing visual simulations of the mine and closure operations was also presented. The tallyman's family expressed a desire to have the pit backfilled with waste rock. This recommendation has been considered and is now part of the project.

When the site is restored, users may be interested in keeping the roads to have better access to the territory for trapping or hunting activities. However, this aspect was not discussed during consultations.

IMPACT ASSESSMENT

The application of mitigation measures will minimize the potential impact on land use during the rehabilitation phase. Consequently, the intensity is considered low. Its extent is local since it affects Cree land users in the study area. The duration will be short term as the impact will only be felt during the rehabilitation phase. The significance of the impact on land use during the rehabilitation phase is considered **minor**.

POST-REHABILITATION PHASE

Following revegetation of the waste rock stockpile and other rehabilitation activities, it is reasonable to believe that during the post-rehabilitation phase, part of the land affected by the mine will be reused and re-appropriated for traditional activities. It should be noted, however, that the Cree users interviewed during the consultations remain skeptical in this regard since they believe it will not be possible to reuse the restored site because of potential contamination (Chapter 5). Galaxy is committed to restoring its mine site in accordance with MERN requirements, which aim to see sites restored to a satisfactory state, including limiting the production and propagation of contaminants likely to harm the receiving environment, eliminating unacceptable risks to health and ensuring the safety of people (MERN, 2017). **To this end, the restoration plan will be prepared in accordance with the requirements of the Mining Act, particularly section 101, and in compliance with the requirements of the Guide for preparing mine closure plans in Québec (MERN, 2017). When preparing this plan, the tallyman will also be consulted. It should be noted that the restoration plan must be approved by MERN and MELCC before the mining lease is issued.**

Communication will continue, as will environmental monitoring. The impact of the project on current use of land and resources for traditional purposes in the post-rehabilitation phase is considered **positive**.

7.4.1.2 AREA ALONG BILLY-DIAMOND HIGHWAY

CONSTRUCTION PHASE

SOURCES OF IMPACT

– **Transportation and traffic.**

MITIGATION MEASURES

Mitigation measures NOR 11, SON 01, UTT 01, UTT 02, CIR 01, CIR 03, CIR 08 to 15, VIE 01, VIE 05, VIE 15 must be applied. These are described in Table 7-5 of the EIA.

DESCRIPTION OF THE IMPACT

The selected area is near the Billy-Diamond highway between kilometre 381 and Matagami and covers a distance of approximately 385 km and a radius of 2 km on either side of the highway. There are no villages near the road, although camps are set up there. The nearest community is Nemaska, 77.5 km from the Billy-Diamond highway. The road crosses or comes within 2 km of twenty Cree traplines belonging to the Cree Nations of Eastmain (2 traplines), Waskaganish (7 traplines), Nemaska (4 traplines) and Waswanipi (7 traplines). The selected area is frequented by Cree people who use the traplines adjacent to the highway (GENIVAR-WASKA Consortium, 2015). The presence of a road access facilitates the establishment of Cree camps and the development of areas for traditional activities (hunting, fishing and trapping) nearby. Thus, in addition to the presence of camps, the roadside may be used for parking, movement (on foot, snowmobile or ATV), activities, or to reach other trails.

During the construction period, traffic generated by the project will be a source of nuisances caused by noise and dust, as well as an increased risk of accidents, and a source of disturbances. As a result, some users may find their traditional activities disrupted or their peace and quiet and sense of security affected. An adaptation period will be necessary. We should also note that since the Billy-Diamond highway is entirely paved, some disturbances such as noise and dust pollution will be limited.

Furthermore, users of the study area are already used to trucks being present on the road. Galaxy has also already met with land users to share information about the project, the expected impacts and planned management measures. It gathered their concerns and expectations, particularly in relation to their travel habits, the main access sites to the camps, snowmobile trails and animal crossings. Routine mitigation measures will also be applied to limit nuisances associated with airborne contaminants and noise. In addition, a traffic management plan will be implemented. Galaxy will provide appropriate signage starting from the Billy-Diamond highway to announce its operations site.

Galaxy workers and contractors will be educated on traditional Cree practises to minimize disturbance. Galaxy will operate an effective complaint management and tracking system to address any issues that the local population may raise.

IMPACT ASSESSMENT

For the reasons mentioned above, the intensity of this impact is considered low; although users' activities and peace of mind will be disrupted by nuisances caused by the project, the practise of these activities will not be threatened. An adaptation period will be necessary for users to adjust their practises to these changes. The extent of the expected residual effects is regional, since the effects are likely to be felt by users of the 20 affected traplines who frequent the study area. The duration is short. Hence, the significance of the impact on land use during the construction phase is considered minor.

OPERATION PHASE

SOURCES OF IMPACT

- **Transportation and traffic.**

MITIGATION MEASURES

Mitigation measures NOR 11, SON 01, UTT 01, UTT 02, CIR 01, CIR 03, CIR 08 to 1, VIE 1, VIE 05, VIE 15 must be met. These are described in Table 7-5 of the EIA.

DESCRIPTION OF THE IMPACT

The effects felt during the operation period will be similar to those felt during construction, i.e., a disruption of traditional activities, of a sense of security, and of the peacefulness of the area, followed by a period of adaptation and adjustment, which will have begun during the construction period. During the operation period, 10-12 trucks per day will use the Billy-Diamond highway to transport lithium concentrate to Matagami.

The standard mitigation measures implemented during the construction phase will continue to be applied during the operation phase and will accelerate the adaptation period for users. The planned mitigation measures will also ensure the safety of users of the Billy-Diamond highway and of the area bordering the highway.

IMPACT ASSESSMENT

The intensity of the impact of project-related transportation on traditional uses along the Billy-Diamond highway is considered minor since, despite the nuisances that the project will cause, users will be able to continue their activities after an adaptation period, even if it means relocating certain activities if they consider it preferable. The extent of the feared residual effects is regional since the effects are likely to be felt by users of the 20 affected traplines who frequent the study area. The duration will be long term. Hence, the significance of the impact on land use during the construction phase is considered moderate.

7.4.2 INFRASTRUCTURE

CONSTRUCTION PHASE

SOURCES OF IMPACT

— Transportation and traffic.
— Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures CIR 01 **to** CIR **03** and **AIR 03**, along with standard NOR 13 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

The anticipated impacts on infrastructure include potential impacts on the Billy-Diamond highway linked to workers' travel and transporting machinery and heavy vehicle traffic during construction. This 620-km road is the main road in the study area, and was originally designed to withstand regular traffic from heavy vehicles. It is maintained by the SDBJ. According to consultations held with the SDBJ **(in 2018)**, the road has been worn down somewhat since its construction; however, the restoration program **to remedy this situation will be completed 2021**.

Certain mitigation measures will therefore be implemented by the SDBJ in connection with this scheduled rebuilt, primarily to reduce the impact on traffic. It will be critical to establish good communication between the SDBJ and Galaxy in order to prevent potential inconveniences to road users. **Galaxy also committed to discussing winter road maintenance with the SDBJ.**

As a result of the Billy-Diamond highway's capacity to withstand heavy vehicle traffic, the anticipated travel of heavy vehicles for the project during the construction phase is unlikely to result in damage or premature deterioration of the road. In addition, Galaxy is committed to keeping public roadways free of obstructions, damage, trash, dirt, sediment, etc. at all times. It is estimated that during the construction phase, which will take place over a 15-month period, 1,800 trips will be made on the Billy-Diamond highway. These trips will be in addition to the 55,500 trips counted on this road for the year in 2017, which represents a 2.2% increase.

As stipulated in Section 6-4, there is a rest stop located in the study area: the km 381 truck stop. Like the Billy-Diamond highway, the km 381 truck stop is part of the SDBJ's assets. Since it offers services such as lodging, restaurants, meeting room rental, mechanical services and laundry services, the km 381 truck stop may very well see an increase in business during the construction period. It is also expected that certain mining services (primarily emergency medical services) will be provided in conjunction with the km 381 truck stop services; however, an agreement has yet to be signed.

During consultations held in 2017-2018, the SDBJ said that it was concerned with the capacity of the **remote landfill** located 190 m from the anticipated pit and whether it would be able to handle the quantity of waste generated by the increased use of the truck stop. This remote landfill has been in use for 35 years, and is still in operation. It only receives waste from the km 381 truck stop; the volume varies according to use. However, as noted in Chapter 4, the waste generated by the mine will not be processed at the remote landfill but **will be sorted and sent off-site**. and the traffic expected at the truck stop at km 381 should not have a negative impact on the landfill site. Moreover, to prevent safety issues, Galaxy will secure the SDBJ's remote landfill by erecting a fence around it. Consequently, there is no anticipated impact on this infrastructure.

IMPACT ASSESSMENT

The remaining residual impact on infrastructure primarily pertains to increased travel on the Billy-Diamond highway during construction. The intensity of this impact is deemed to be low, since the increase will be minor. The extent of the effect will be regional, since it will be felt over the portion of the Billy-Diamond highway from km 381 to Matagami. The duration will be short, limited to the construction phase. The significance of the impact on the infrastructure during the construction phase is considered to be **minor**.

OPERATION PHASE

SOURCES OF IMPACT

- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures AIR 03, VIB **02** to VIB 04, and CIR 01 to CIR 04, **as well as CIR 08 to CIR 10** must be applied, in addition to standard NOR 13. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

Given that the Billy-Diamond highway is an important roadway, that it was designed to withstand regular heavy vehicle traffic, and that the SDBJ **will complete** road repair work **in 2021** prior to the start of mine operations, project vehicle traffic during the operation phase is unlikely to result in damage or premature deterioration of this road. **However, if the increase in traffic associated with the project resulted in the need for repairs, Galaxy would discuss this with the SDBJ, since they manage maintenance on the road. Galaxy will take care of repairs directly related to the project.**

During each week of the operation phase, the Billy-Diamond highway will sustain: 154 truck trips for mine production transport **(77 round trips)**, 35 truck trips for procurement, and 12 bus trips (6 one-way trips) to transport workers between the Eastmain airport and the mine site. This means that **10,452** trips will be added to the 55,500 trips recorded in 2017 on the Billy-Diamond highway, representing an **18.8% annual** increase. It should be noted that the 3% annual increase corresponds to very short bus trips (approximately 20 km) between the Eastmain access road and worker camp. Furthermore, these trips will be spread out during daytime hours, for the most part.

However, this increase in traffic will require a change in Billy-Diamond highway users' habits: they will need to be doubly careful since they will share the road with more vehicles, many of which will be heavy vehicles. That being said, with the mitigation measures that will be implemented, drivers should be able to quickly adapt to the additional traffic that will be generated.

Despite a smaller number of workers during the operation phase, the km 381 truck stop will still experience a higher usage rate than before the mining project began, which in turn will make the services offered even more profitable. In fact, a large number of contractors and subcontractors who have short-term assignments at the mining site would be able to stay at the km 381 truck stop.

At the beginning of the operation phase, users of the Billy-Diamond highway and Route 109 in Matagami may have to adapt to the increased number of heavy vehicles travelling to the transshipment centre due to the increased risk of accidents, dust and pollution generated by these trucks. Where appropriate, routine traffic mitigation measures on the Billy-Diamond highway will be extended along Route 109 up to the transshipment site. The site's safety measures and standards will then be applied and will mitigate disturbances linked to this increase in activity.

IMPACT ASSESSMENT

— The residual impact on infrastructure during the operation phase relates more specifically to the increase in traffic on the **Billy-Diamond highway and on Route 109, mainly in Matagami**. Overall, the intensity of this impact is deemed to be quite low, since the volume of traffic generated by the mining activities will be spread out over the entire day, and night travel will be infrequent. Its extent is regional since the impact will extend along the entire route **from** km 381 **of the Billy-Diamond highway to** Matagami. The duration is short since, within a few years, the Billy-Diamond highway users will be accustomed to the presence of the mine and will have adapted to the new volume of traffic. Globally, the significance of the impact on the infrastructure during the operation phase is considered to be **minor**.

REHABILITATION PHASE

SOURCES OF IMPACT

— Transportation and traffic.
— Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures CIR 01 to CIR 04 must be applied. They are set out in Table 7-5.

DESCRIPTION OF THE IMPACT

During the rehabilitation phase, which will be spread out over time, approximately 1,800 trips will be taken on the Billy-Diamond highway. These trips will be marginal, since the discontinuation of the mining activities will result in a global decrease in the number of trips. Furthermore, customer traffic at the km 381 truck stop will be similar to that observed during the construction phase due to the number of workers present. The resulting economic benefits will have a positive impact.

IMPACT ASSESSMENT

— Just as with the construction and operation phases, the residual impact on infrastructure during the rehabilitation phase primarily pertains to traffic on the Billy-Diamond highway, between km 381 and Matagami. The intensity is considered to be low, given the decrease in traffic that will occur as compared to the conditions during the operation phase. Its extent is regional and duration will be short, since the impact will only be felt during the rehabilitation phase. Thus, the significance of the impact on the infrastructure during the rehabilitation phase is considered to be **minor**.

POST-REHABILITATION PHASE

Once the site has been restored, impacts will be non-existent, since no mining activities that would be likely to affect infrastructure will take place.

7.4.3 PERCEPTION OF THE PHYSICAL ***AND NATURAL ENVIRONMENT***

CONSTRUCTION PHASE

SOURCES OF IMPACT

— **Site preparation and infrastructure construction.**
— **Water management.**
— **Transportation and traffic.**

MITIGATION MEASURES

Mitigation measures PER 01, UTT 02, CIR 01, CIR 02, CIR 04, CIR 05, VIE 01, VIE 15 and VIE 22 must be applied, in addition to the measures intended to protect the soil (SUR 03 and SUR 04) and decrease atmospheric emissions (AIR 01 to AIR 05), noise (SON 01), water contamination (QUA 01 to QUA 05, QUA 07 to QUA 13), night-time lighting (LUM 01 to LUM 03), vibrations and air overpressure (VIB 01), and all relevant standards (NOR 2 to NOR 5, NOR 8, NOR 9, NOR 11, NOR 13 and NOR 14). These are set out in Table 7-5.

DESCRIPTION OF IMPACT

Activities associated with the construction phase will cause various nuisances that could affect the perception of the quality of the air, light and sound environment, as well as the quality of groundwater and surface water, and, more generally, the integrity of the territory. Moreover, even if regulatory requirements are met, the vibrations felt by Cree users of the territory who engage in activities in the area of the mine, or by workers at the km 381 truck stop and its visitors, could exacerbate the perception that the territory is no longer the same and its quality has declined. It should be noted that before construction begins, land users will be informed of when it will start and of its progress. Furthermore, an area closed to traditional activities near the mining site will be established in collaboration with the Tallyman, thereby limiting the use of this sector.

Since the site is in an isolated area, the current air quality in the area studied is very good. During the construction phase, activities to prepare the site and to build infrastructure will change the air properties since there will be an increased suspension of particulate matter in the air. However, results of the air dispersion modelling study show that the standard will be met at the sensitive receptors. In this regard, users of traplines RE2, VC33 and VC35 believe that the project's effects on air quality will be felt in a wider area, beyond the radius used for modelling. In addition, the people we met raised the issue of the effects of dust accumulation on plants and dust infiltration into the soil, and the effects that ingesting these plants might have on the quality of wildlife resources, such as beaver, moose and geese. Furthermore, people have observed deformities in moose and attributed them to radiation from power lines near their feeding grounds.

Regarding ambient noise, the only current anthropogenic contributors of noise in the local study area are the Billy-Diamond highway and the km 381 truck stop. During construction, the standards set out will be met. The noise modelling study that was done shows that noise levels during operations (under the worst operating conditions) will be compliant (WSP, 2021c). The construction activities planned will be smaller in scale than those simulated. Thus, noise levels will increase, but will still be acceptable. As with air quality, Cree land users believe that the radius used to measure the project's effects on the noise climate is too small and that noise will be perceived within a wider area. They are also concerned about the effects of noise on the migratory routes of geese.

Since the site is in a remote location, sources of vibrations within the study area are nearly non-existent. Vibrations may occur during construction in conjunction with quarry operations. However, blasting operations will be less significant than during the operations phase. Currently, it is expected that vibration thresholds at the km 381 truck stop will be acceptable, as well as the other sensitive areas surrounding the pit. These elements confirm that activities of a lesser scale will also be acceptable. However, some may still feel vibrations when blasting occurs. For their part, Cree land users are concerned that vibrations could have an impact on sturgeon because of the presence of a new spawning site on the Eastmain River, which could be disturbed. The people we met believe that sturgeon are more sensitive to environmental disturbances than humans and that they could feel vibrations in the water that are imperceptible to humans. It should be noted, however, that this site is 10 km north of the project site and that the vibration waves from blasting do not reverberate that far.

In the study area, the only current artificial lighting at night comes from the km 381 truck stop. It emits very little light and the effect it has on the night sky fades quickly as you drive away from it. Some changes are expected since artificial lighting will be added to Galaxy's facilities during construction.

During the consulting activities that took place from 2017-2018, SDBJ's representative expressed a concern that the mining activities, from the start of construction through the end of rehabilitation, may affect the km 381 truck stop's drinking water supply, sourced from artesian wells on its property. It should also be noted that Cree land users also draw their drinking water from the same location when they stay at their camps. There are two drinking water sources in this location. Construction activities are not likely to affect the drinking water supply at the km 381 truck stop.

As for surface water, current conditions measured in the study area are representative of natural environments, even though they have quite high acidity levels and contain certain metals due to the presence of peatlands and to the nature of the rock and unconsolidated deposits. At the sampling stations inventoried, the surface water is generally unaffected by human activity. No change to the surface water quality is anticipated during construction. The risks of accidental spills remain, but Galaxy's emergency response plan allows for those to be dealt with quickly, if such an event were to occur. Cree land users were particularly worried about the risk of accidental spills because the mine's topography is higher than the Eastmain River. They are concerned about a possible contamination of this river, other small waterways (particularly creek CE5, which is an area users value), peatlands and groundwater, which they believe could occur through percolation. They are also concerned about the effects this potential contamination may have on animal resources, including fish. They also questioned the effectiveness of the treatment of the water discharged with effluent and mentioned that even if it is treated, the discharged water will not have the same quality as it had originally. Still on the subject of the project's effects on surface water and groundwater, the Cree people who frequent this territory are concerned about the impact on water flow.

The tranquility of the area, especially the Cree camps located close to the mining site itself, could also be affected by construction activities. People who are used to performing traditional activities in the projected infrastructure sector could find their safety compromised by the site's new use. In fact, during consultations with Cree land users, concerns were also raised about safety both on the road (accidents, road deterioration) and in the camps based on concerns about break-ins due to the presence of workers. However, the Cree land users and workers at the km 381 truck stop will be able to view the survey and environmental monitoring reports that will monitor the status of the situation in terms of water, air, noise and soil. Furthermore, beginning with the construction phase and throughout the entire project period, mechanisms will be put in place so that worrisome situations can be reported to and handled by Galaxy.

Finally, some Cree people may think that the integrity of the land they knew has been altered. This perception could be reduced by involving Cree users in the development of mitigation measures. This would allow them to regain some control over the changes made in the territory and could promote acceptance of the change.

IMPACT ASSESSMENT

The intensity of this impact is deemed to be low due to the activities specific to the construction phase, which will produce less disturbance. Furthermore, the mitigation measures will decrease the potential negative effects. The extent of the expected residual effects is deemed to be local, since they will likely only be felt by Cree land users who access certain specific sectors around the mining site, as well as the dozen or so workers and visitors at the km 381 truck stop. The duration is short. Thus, the significance of the impact on the perception of the physical environment during the construction phase is considered to be minor.

It should be recalled that, although the modelling results show that impacts will remain within the scope of the modelling, Cree users in the area believe that some nuisances during the construction period will be felt within a wider perimeter than the one used to perform the air quality and noise climate modelling studies. In addition, the effects of construction activities on their negative perception of environmental and water quality will continue over time since they consider these changes to be irreversible. Thus, according to their assessment, despite the low intensity, the extent of residual effects would be local and long term; therefore, the significance would be moderate. Environmental monitoring will ensure that impacts related to construction activities are not prolonged over time.

OPERATION PHASE

SOURCES OF IMPACT

- **Presence and operation of the pit.**
- **Other infrastructure in operation.**
- **Management of process plant feed material, overburden and waste rock Water management.**
- **Transportation and traffic.**

MITIGATION MEASURES

Mitigation measures PER 01, UTT 02, CIR 01, CIR 02, CIR 04 to CIR 06, and VIE 01 must be applied, in addition to the measures intended to decrease air emissions (AIR 01 to AIR 05), noise (SON 01), water contamination (QUA 01 to QUA 05, QUA 07 to QUA 13), night-time lighting (LUM 01 to LUM 03), vibrations and air overpressure (VIB 01 to VIB 04), as well as all relevant standards (NOR 2 to NOR 9, and NOR 11 to NOR 14). These are set out in Table 7-5.

DESCRIPTION OF IMPACT

During the operation phase, operations are likely to cause more nuisances than during the construction phase, and therefore affect the perception of the quality of the air, light and sound environment, and the quality of groundwater and surface water, and, more generally, the integrity of the territory. In addition, the vibrations felt by Cree land users who engage in activities in the area of the mine, and by employees at the km 381 truck stop and visitors who stop there, could exacerbate the perception that the territory is no longer the same, and its quality has diminished. As stipulated for the construction phase, the number of Cree land users in the mining sector will be decreased with establishment of an area closed to traditional activities.

The impacts described for the construction phase are similar to those for the operation phase. Thus, air quality will be altered by mining operations since an increase in suspended particulate matter will change the air properties. However, results of the air dispersion modelling survey show that the standard will be met at the sensitive receptors. As for noise, the noise modelling study shows that noise levels during operations (under the worst operating conditions) will be compliant (WSP, 2021c). Thus, noise levels will increase, but will still be acceptable. It should be recalled that, like for the construction period, users of traplines RE2, VC33 and VC35 believe that the project's effects on the air quality and noise climate will be felt over a wider area than the one used for modelling. They also worry about the accumulation of dust on plants and the infiltration of dust into the soil, and the effects that ingestion of these plants may have on the quality of wildlife resources. Furthermore, people have observed deformities in moose and attributed them to radiation from power lines near their feeding grounds. Finally, they are also concerned about the effects of noise on the migratory routes of geese.

Since the site is in a remote location, sources of vibrations in the study area are nearly non-existent. Vibrations will occur when blasting takes place in the pit. The vibration thresholds at the km 381 truck stop and other sensitive areas surrounding the pit will be acceptable. When the values calculated were close to the limits, mitigation measures were added to ensure the thresholds were not exceeded. However, some may still feel vibrations when blasting occurs. As mentioned above, Cree land users are concerned that the vibrations could have an impact on sturgeon because of the presence of a new spawning site on the Eastmain River, which could be disturbed. The people we met believe that sturgeon are more sensitive to environmental disturbances than humans and that they could feel vibrations in the water that are imperceptible to humans.

In the study area, the only current artificial lighting at night comes from the km 381 truck stop. However, some changes are anticipated since artificial lighting will be added to Galaxy's permanent facilities, in addition to that needed for operations.

As previously indicated, SDBJ had expressed a concern that mining activities may affect the km 381 truck stop's drinking water supply. The specialized hydrogeology report demonstrated that groundwater lowering associated with the pit will be minimal where the wells are located (WSP, 2018a). In that respect, Galaxy has agreed to monitor the groundwater levels and verify the results of the hydrogeological modelling.

According to the INSPQ, the issues of water quality, quantity and access are the Cree's primary concerns (INSPQ, 2014). As mentioned for the construction period, Cree land users showed that they were particularly concerned about the risks of accidental spills because the topography of the mine is elevated in relation to the Eastmain River. They fear that the river may be contaminated, in addition to the contamination of other small waterways (especially creek CE5, which is an area users value), peatlands and groundwater, which they feel could occur through percolation. They are also concerned about the effects this potential contamination may have on animal resources, including fish. They also questioned the effectiveness of the treatment of the water discharged with effluent and mentioned that even if it is treated, the discharged water will not have the same quality as it had originally. Still on the subject of the project's effects on surface water and groundwater, the Cree people who frequent this territory are concerned about the impact on water flow.

To that end, the watercourses in the study area were subjected to chemical analyses (water and sediments) within the context of a specialized study on aquatic habitat (WSP, 2018e). The watercourses in question run from east to west, toward the Eastmain River. They hydrographic system in the local study area represents a very low percentage of the Eastmain River's watershed (0.1% total). During operations, run-off water from the entire site will be captured and channelled to water retention basins. If necessary, the water will be treated at the water treatment plant before it is discharged into the environment. Under future conditions, water quality will be ensured by means of a monitoring program. Furthermore, D019, MDMER and EDO requirements will also be met.

As is the case during the construction phase, the tranquility of the premises, especially in the Cree camps located around the mining site itself, could also be affected by mine activities. People who are used to performing traditional activities in the projected infrastructure sector could find their safety compromised by the site's new use. The communication measures put in place during the construction phase will continue during the operation phase. Environmental monitoring and follow-up reports will also be made available. For safety purposes, the area closed to traditional activities that is established in collaboration with the Tallyman during the construction phase will be maintained.

Lastly, like for the construction period, some Cree people may feel a sense of loss related to the alteration of the integrity of the territory they knew. This perception could be reduced by involving Cree users in the development of mitigation measures. This would allow them to regain some control over the changes made in the territory and could promote acceptance of the change.

IMPACT ASSESSMENT

During the operation phase, the intensity of this impact is deemed to be moderate since activities specific to this phase will feature a higher number of sources of disturbance. That being said, the mitigation measures will decrease the potential negative effects. The extent of the expected residual effects is deemed to be local, since they will likely only be felt by Cree land users who access specific sectors around the mining site, as well as the dozen or so workers and visitors at the km 381 truck stop. The duration is long, although the impacts may not be continuously felt. Thus, the significance of the impact on the perception of the environment during the operation phase is considered moderate.

It should be recalled that Cree users in the area believe that some nuisances during the operating period will be felt within a wider perimeter than the one used to conduct the air quality and noise climate modelling studies. In addition, the effects of the mine's operations on their negative perception of environmental and water quality will continue over time since they consider these changes irreversible.

REHABILITATION PHASE

SOURCES OF IMPACT

- **Infrastructure dismantling Water management.**
- **Transportation and traffic.**
- **Economic development and presence of workers.**

MITIGATION MEASURES

Mitigation measures PER 01, UTT 02, CIR 01, CIR 04, CIR 05, VIE 01, VIE 15 and VIE 22 must be applied, in addition to the measures intended to protect soil (SUR 03 and SUR 04) and decrease air emissions (AIR 01 to AIR 03), noise (SON 01), water contamination (QUA 01 to QUA 05, QUA 07 to QUA 13), nighttime lighting (LUM 01 to LUM 03), and all relevant standards (NOR 1 to NOR 9, NOR 11, NOR 12 and NOR 14). These are set out in Table 7-5.

DESCRIPTION OF IMPACT

During the rehabilitation phase, the risks of disturbance will be, for all intents and purposes, the same as for the construction phase.

IMPACT ASSESSMENT

Application of the mitigation measures will minimize the potential impacts on the risks of disturbances during the rehabilitation phase. As a result, the intensity is considered low. Its extent is deemed to be local, since it pertains to Cree land users in the sector surrounding the mine, as well as the km 381 truck stop workers and customers. It will be of short duration, as the impact will only be felt during the rehabilitation phase. The significance of the impact on territory use during the rehabilitation phase is considered to be minor.

POST-REHABILITATION PHASE

The negative perception associated with the site remains, is one element that was brought out during the consultation activities that took place within the Eastmain community in 2017-2018. The concerns pertain to possible contamination of the lakes and watercourses surrounding the mine, the effect on resources (fish, wildlife, plants or other natural resources) used for traditional purposes, as well as its effect on human health. Some people are also worried about the potential effects on future generations. The potential impacts on the perception of the physical environment during the post-rehabilitation phase are negative. All in all, implementation of the rehabilitation plan complies with MERN requirements, and the monitoring program arising out of those should help to minimize this impact.

7.4.4 QUALITY OF LIFE

The impacts of the project on the quality of life and well-being were assessed for the Cree First Nations as well as for the community of Matagami, given the transport and transhipment activities planned during the operation phase, in response to the request issued by the MELCC during the analysis of the 2018 ESIA.

7.4.4.1 CREE FIRST NATIONS

CONSTRUCTION PHASE

SOURCES OF IMPACT

- Site preparation and infrastructure construction.
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures UTT 01 **to UTT 05**, CIR 01, **CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16**, VIE 01 to VIE **22**, **ELR 05, ELR 06, ELR 13 and PER 01** must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

Cree Community Values

One fear often mentioned by stakeholders met during public consultation activities was of seeing community values that are very important to the Cree (mutual assistance, support, etc.) disappear or diminish to give way to individualism. They also fear the same for traditional activities (e.g.: hunting); some Eastmain community members are afraid interest will decrease.

Therefore, the feeling of loss or damage to the Cree cultural identity is one of the project's expected impacts on the quality of life. Use of the territory for traditional purposes is more than just the Cree's livelihood. It provides their identity, and translates into a deep feeling of belonging to the land. This is the place that holds their collective and individual memories, important events, births and deaths, legends and beliefs. In this respect, preparing the land and building infrastructure may affect some members of the Cree communities and contribute to a feeling of progressive loss of their traditional way of life and cultural identity. **For elderly people in particular, who have lived the traditional Cree way of life since their youth and who are deeply attached to carrying on the traditions and passing down Cree identity, the project could be a disruptive event in the territory, in addition to other events they have witnessed since the development of the James Bay territory. This could lead them to oppose the project and to develop mistrust toward it and its promoter. For many elderly people, the well-being of James Bay Cree territory residents depends on more than material well-being; it depends on having access to the territory and maintaining subsistence activities (INSPQ, 2014).**

In addition, population subgroups of the Eastmain and Waskaganish Cree Nations, particularly women, youth and elders, could also suffer negative impacts or, conversely, benefit from positive impacts related to mining development. In this respect, the study area corresponds to the territorial boundaries of each of these two communities. Galaxy is committed to adopting a series of measures to enhance the positive impacts and mitigate the negative impacts of the project during the construction phase on the Eastmain and Waskaganish subgroups of the Cree Nations population.

Road Safety

Transportation related to construction activities could also lead to Billy-Diamond highway users feeling less safe and to the perception of an increased risk of accidents, a concern that was primarily raised by women, **representatives of the Waskaganish community** and land users during consultations held in June 2018. Road safety on Billy-Diamond highway is ensured by Sûreté du Québec. The police stations in the cities of Matagami and Radisson provide these services. Furthermore, Galaxy will establish a traffic management plan to minimize inconveniences associated with the increased road traffic. **This plan is an integral part of Galaxy's operations management system, which includes Environmental, Health and Safety standards.**

All work phases, including field campaigns, are subject to a risk analysis. The results of the risk analyses lead to the implementation of procedures which all employees and contractors involved in the work must follow. These procedures also include the transportation management plan.

As part of the Galaxy management system, a transportation management plan and a communications management plan will be developed. The content of these plans has not yet been developed, but it will include a list of stakeholders with the topics to be covered, the frequency of events, the means of communication and a person responsible for implementation. There is currently a journey management plan for the pre-construction period, which will be modified for the construction period and then for the operation.

By implementing this plan, Galaxy will ensure that security features are in place, including:

- **signage and traffic checks, measures and procedures;**
- **vehicle specifications (speed controllers, low-reflection lights and covered trucks);**
- **routine inspection procedures and other transportation-related requirements, such as weather conditions when traveling;**
- **radio communication protocols;**
- **records of any problems encountered (breakdowns, road conditions, presence of animals, etc.).**

In addition, accidents along the route will be monitored to determine if there is a recurrence, to verify and identify problems, if any, and to propose corrective measures. The transportation management plan will also include mandatory driver training, logbooks and safety awareness programs.

It will also include a description of on-site and off-site roads (width, number of lanes, speed limits, lighting and maintenance), on-site and off-site fleets (frequencies and loads), potential travellers to the site (suppliers, workers, contractors, visitors, concentrate transporters), and rules to be followed, such as training, procedures, signage, receiving and handling complaints.

More specifically, for traffic on the mine site, measures already planned are signs identifying the site from the Billy-Diamond highway and the presence of a gatehouse with a guard to control access. The gatehouse will be located at the entrance to the work site / mine (depending on the phase of the work), approximately 50 m from the Billy-Diamond highway. It should be noted that the northern and western boundaries of the work site / mine are not easily accessible, and a 30 m strip of land will be cleared to protect the infrastructure from the risk of forest fires. On the south side, there will be a fence between the truck stop waste dump and the mine site, in this case the pit.

In addition, the traffic plan will be developed in collaboration with land users. Galaxy will be sure to take recommendations from land user consultations into consideration and to obtain relevant information and details about the various measures that were identified. Thus, the plan will take into account the travel habits of the land users and the main access sites to camps, snowmobile and ATV trails, and animal crossings, or any other site or element of interest to the stakeholders. The traffic management plan will be reviewed, updated, and enhanced as necessary, at least annually, including any changes and incidents that occur.

Specific measures will be taken to inform truck drivers of concerns raised by Cree stakeholders regarding the safety of the population and land users, particularly during periods of hunting and trapping activities, which may take place along roadsides. Concerns were also raised about disturbance to wildlife and what impact it may have on traditional activities. In fact, any other measures likely to be effective in addressing the Crees' concerns could be implemented.

The intersection of the Billy-Diamond highway and the truck stop will be a key element of the traffic management plan. Truck drivers will be made aware of the importance of exercising caution at this location in order to limit road sharing conflicts. The truck stop will remain available to road users for refuelling and access to water.

Integration of Cree workers

Difficulties with integrating the Cree workers into the working environment could be experienced during the construction phase; there is also the risk of tension between them and the construction contractors' non-Cree workers. Experience gleaned from other projects on the EIJB territory, most notably that experienced by workers at the Troilus mine, brought to light the challenges that come with integrating Cree workers into the working environment. This population is faced with having to adapt to issues relating to language, management, work schedules and cultural habits (Roquet, 2008).

The project will also intensify relationships between members of the Eastmain communities and the construction contractors' non-Cree workers. In certain projects, the situation led to tensions stemming from cultural and contextual misunderstandings, not to mention prevailing prejudices that exist between the two groups. Galaxy will develop a code of ethics for its workers, and the construction contractors' workers will also need to follow it. The population will be able to share their comments and concerns with Galaxy at any time through an internal community relations department.

Health

Lastly, health and social service providers met during the consultation activities shared their concerns regarding the pressure that the Eastmain community's health services may feel, due to accidents that could occur during construction.

A health care and emergency medical service will be set up at the time of construction to serve the project's workers. Galaxy will operate it independently on its site. In accordance with the First-aid Minimum Standards Regulation (RLRQ A-3.001, r.10), a nursing service with a first aid room and first aid attendants must be provided for the Galaxy workers' camp. Therefore, no significant additional pressure will be put on the Cree First Nations health system.

An agreement with the SDBJ is currently being developed so that this service can be offered jointly with that of the truck stop at km 381, given their proximity. The Nemaska and Eastmain medical services, which are under the jurisdiction of the CCSSSBJ, are the closest geographically to the truck stop. The CCSSSBJ currently provides medical services to the truck stop from Radisson and may soon provide ambulance services to the truck stop.

Galaxy is still in communication with the CCSSSBJ and, as suggested, will contact the Council of the Cree Nation of Eastmain, to discuss how to collaborate with CCSSSBJ ambulance services. There is a willingness on both sides to collaborate, but no decision has been made yet.

If needed, Galaxy's medical service will be able to assist truck stop employees and residents with emergencies and major accidents. However, Galaxy's medical service cannot become a local medical centre that is accessible at all times. Finally, the problem of risky sexual behaviour (early pregnancy, STIs, teenage mothers) and concerns related to prostitution due to the influx of workers are more specifically addressed in the operations phase, although they are also present during the construction phase.

IMPACT ASSESSMENT

- Application of the mitigation measures will minimize the potential impacts on the quality of life during the construction phase. Overall, the intensity of this impact is deemed to be low, since it is recognized that difficulties will not be felt as strongly at the start of the project as they will during operation. Its extent is regional, since it affects Cree mine workers and the Eastmain **and Waskaganish** Cree communities. Lastly, the duration of the impact is short. Globally speaking, the significance of the impact on the quality of life during the construction phase is considered to be **minor**.
- **Regarding negative impacts on women, youth and elderly people in the Eastmain and Waskaganish communities during construction, the effects will be minimized by applying mitigation measures. Since Galaxy will implement its mitigation measures during the first few months of the construction phase, the impact's intensity will be low. Its extent is regional since it affects the Cree communities of Eastmain and Waskaganish. Lastly, the duration of the impact is short. Overall, the significance of the impact on women, young people and elderly people in the affected communities during the construction phase is considered minor.**

OPERATION PHASE

SOURCES OF IMPACT

- Presence and pit mining.
- Other infrastructure in operation.
- Management of process plant feed material, overburden and waste rock Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures UTT 01 to UTT 06, CIR 01, CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16, VIE 01 to VIE 22, ELR 05, ELR 06, ELR 07, ELR 08, ELR 13 and PER 01 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

Cree Community Values

The impacts described for the construction phase, such as feelings of loss and damage to the Cree cultural identity, Billy-Diamond highway users' increased sense of being unsafe, and difficulties integrating Cree workers into the workplace, could also be felt during the operation phase.

Galaxy will continue to implement mechanisms for integrating workers since it was demonstrated that the tensions felt were the biggest issue within the context of long-term employment (operation phase), as workers are together for a longer period of time. Non-indigenous workers will be sensitized to the Cree **First Nations** traditional practises **and to cultural diversity**. Thus, within the context of more long-term relationships, problematic interethnic relationships could deteriorate over time. However, the relatively long duration of the employment, provided that the relationships are good, constitutes an opportunity to bring the two groups of workers closer together. **An intercultural training component in the orientation program is also planned.**

With the implementation of the employment equity and workplace harassment policy, the company is committed to equity in terms of gender, sexual orientation, family status, family responsibilities, ethnic origin, disability, political or religious beliefs and age. No form of harassment or discrimination will be tolerated, as stated in the company's policies. Disciplinary measures will be imposed according to the severity of the actions committed.

Studies conducted by Hydro-Québec as part of the Eastmain-1-A-Sarcelle-Rupert project demonstrated that implementing appropriate measures such as discussions, cultural awareness programs and creating a respectful work climate promotes the integration of workers into the workplace (Hydro-Québec and SDBJ, 2009; Roquet, 2008).

These studies also brought to light that separation from family is the main job difficulty that Cree workers mentioned. **The work schedules specific to mining projects (during both construction and operation phases), and more specifically the extended stays on the project site, have health and social impacts on families, women and children (INSPQ, 2014). During consultations, particularly with the CCSSSBJ and the CSCBJ, some participants expressed concern about the effects that Cree workers' work schedules could have on families, including a possible increase in the removal of children from their families or seniors left to fend for themselves because their loved ones are absent. The project could be associated with a reduction in the amount of time that Cree workers employed on the project will be able to devote to caring for elderly people in their network, or for children in their family.**

Single-parent families, the heads of which are generally women, are numerous in Cree communities. Work-life balance may therefore be a challenge for women employed at the mine, as well as for the partners of mine workers. In addition, the INSPQ mentions that the high birth rate in Cree First Nations increases the chances that an employee will be pregnant or breastfeeding during her employment period. Galaxy is planning many measures to mitigate the project's impact on work-life balance for both female Cree employees and women in the Cree communities, including the possibility of working in the company's offices located in the Eastmain community.

Galaxy will also attempt to take these concerns into consideration by offering workers flexible schedules, particularly by allowing them to take leave for family reasons.

In addition, in order to allow Cree workers to maintain their cultural traditions, Galaxy will establish an annual schedule of the main traditional activities before the construction phase and will schedule its production shutdowns so as **to do maintenance work during periods of about ten days,** according to their participation in these activities, **namely hunting geese in the spring and hunting moose in the autumn. These production shutdowns will limit disturbances to wildlife during the goose-hunting season and facilitate traditional activities for Cree workers. Another measure will be to promote the possibility of taking days off during these periods. Other measures will also be possible, after discussion with the monitoring committee, if concerns are expressed. Galaxy wants to ensure that all Cree workers are satisfied with their living environment at the worker camp and with their overall quality of life, particularly by offering reasonable accommodations and flexible work schedules. Shift rotations for Cree employees may vary depending on the type of job and will not necessarily follow the shift patterns commonly used at other mine sites. This is also intended to make jobs more accessible to Cree people, especially women, and to promote work-life balance for employees, especially those with elderly family members or dependent children. As mentioned above, Galaxy will not discriminate in any way during its hiring process. The possibility of adjusting work shifts will be studied in greater detail at a later stage and following further consultations.**

It should be noted that the creation of a Cree cultural village inspired by the Éléonore mine initiative in the Wemindji territory is not likely. The Galaxy project area does not allow for as much infrastructure as the Eleonore project, and the ground is 75% wetlands.

Social issues

The possible increase in social problems, such as alcohol and drug consumption or compulsive gambling, among Cree workers or in Cree communities, was an anticipated impact raised by those interviewed during public consultations. It seems that the connection between employment and drug and alcohol abuse is not a given. In fact, abusive consumption is associated with less regular employment and lower income, while moderate consumption is correlated with better income (French and Zarkin, 1995). As a general rule, regular employment is also a key determinant of health, both physical and mental, and is associated with better lifestyle choices (Thériault and Gill, 2007). Nevertheless, for people who already abuse drugs and alcohol, an increase in income could facilitate access.

These issues may sometimes be linked to other issues such as domestic violence, the victims of which are most often women. For its part, the INSPQ (2014) indicates that certain social and psychological problems, such as drug addiction, unemployment, discrimination and depression, can lead to bouts of violence in some people. The consumption of alcohol and drugs, as well as violence, are prevalent in the James Bay Cree territory and seem to affect young adults in particular (INSPQ, 2014).

To prevent the development or growth of such social problems, Galaxy will prohibit any consumption of alcohol **or drugs** in the worker camp and any form of video lotteries or gambling on site. **Galaxy is also in discussions with the SDBJ to ensure compliance with applicable truck stop regulations and proper monitoring of alcohol and drug use. Measures will also be implemented to prevent violence at the mine site and in the Cree communities of Eastmain and Waskaganish.**

Galaxy has a policy that requires its employees and those of its contractors and business partners to be physically, mentally and emotionally fit to work and not pose any risk to their own or others' wellbeing, and will apply this policy at its mine site. The policy requires, among other things, that supervisors or managers assess the fitness for duty of employees under their supervision, either by observation or testing. Galaxy has a travel management procedure in place, according to which every trip its employees, contractors and business partners make to the mine site will be recorded. Galaxy checks the identity of its itinerant workforce at the mine site. Currently, this procedure applies to the pre-construction period, and will be updated for the construction and operation periods.

Concerns about sexual harassment of women were also raised in focus groups. The Cree First Nations have proposed that workshops be organized for Cree and non-Cree workers to prevent sexual harassment. It was also suggested that a grievance process be set up. Galaxy does not tolerate any form of harassment or discrimination in its corporate policies and provides for disciplinary measures to be imposed based on the severity of the acts. Other measures intended to create and maintain a healthy and respectful work environment will help prevent these types of problems from occurring. Galaxy will ensure that its liaison officer is able to maintain a relationship of trust with Cree employees so they can more easily confide in him/her when necessary, and that appropriate measures are put in place. In addition, the Human Resources Department, which will include at least one Cree woman, will ensure the wellbeing of its employees, including Cree women, and provide support and follow-up to women who are victims of harassment. Galaxy has also contacted the Cree Women's of Eeyou Istchee Association (CWEIA) and future discussions will focus on implementing additional measures to promote the creation of a safe environment that is free of sexual harassment for Cree women.

Galaxy employees are expected to remain at the worker camp during their shifts, and no transient visitors are allowed on the site. Since some employees of contractors will be staying at the truck stop, which is owned and operated by the SDBJ, the truck stop's rules will have to be respected. If women or men at the km 381 truck stop appear to be engaging in prostitution, the staff in charge of the truck stop will contact the police. Galaxy acknowledges that police brutality against women has been reported in the past, including in Val-D'Or. Any calls to the police involving Galaxy employees or contractors will be recorded and tracked by the human resources department.

Health

Other significant discrepancies have been observed with regard to the health condition of the Cree and of First Nations peoples in general, as compared to the rest of the Québec population. These discrepancies are especially pronounced in terms of life expectancy, intentional and unintentional trauma, the prevalence of many chronic illnesses (e.g.: diabetes, obesity, hypertension) and infectious illnesses, as well as psychological distress (Secrétariat aux affaires autochtones, 2018). To this effect, Galaxy will propose measures to encourage healthy lifestyle habits such as healthy and balanced meals (low in sugar and trans fats) **or the installation of a gym** at the worker camp site.

The mining development project could also generate or increase risky sexual behaviours and unwanted pregnancies, and exacerbate problems associated with the higher incidence of STIs in James Bay Cree communities. In addition, mining development may accentuate a higher birth rate among teenage mothers and less educated women, and concerns about prostitution at the km 381 truck stop. In this context, Galaxy has planned a series of measures to mitigate these impacts and is working with the Cree Women of Eeyou Istchee Association to organize a focus group to develop plans for safety, communication and best practises and to reach out to qualified women interested in working.

Quality of life

One of the possible negative effects associated with getting a well-paying job at the mine is excessive debt in Cree households. **Young employees who are at their first job may be at greater risk of experiencing debt problems (INSPQ, 2014).** The income could facilitate access to credit for purchasing items. Case studies have shown that this issue was observed in several communities (El Kreshi, 2009). Galaxy's human resources department will work with Cree workers to help educate them on smart money management.

An anticipated impact is an improvement in workers' and certain community households' quality of life. The project will provide jobs for people from various socioeconomic groups within the Cree population, such as specialized and non-specialized workers, adults and youth alike. In all, **a maximum of 167** workers will need to be hired to meet the mine's requirements. It is also important to emphasize that the jobs offered during the operation phase will be full-time and long-term. Income from these jobs and contracts awarded to Cree businesses will contribute to improving the quality of life for not only Cree workers, but also a large part of the Cree communities' population**, including women and young people**.

Seniors are the least likely to personally experience positive impacts associated with the economic benefits of the project since they are not directly involved in the jobs and contracts offered by Galaxy. However, they could benefit from an improved quality of life in their families, and investments in the community (new services or infrastructure) linked to the funds negotiated in the IBA with Galaxy. However, impacts related to the emergence of family tensions or polarization of opinions could potentially be felt by seniors especially. In fact, since the benefits of the project mainly relate to employment and contracts, tensions could arise within the Cree First Nations, between those who benefit from these advantages and those who do not, or who experience more negative effects related to a sense of loss of territorial integrity.

Lastly, the potential increase in the Cree households' income could also have a positive effect on the Cree population's health. It is a known fact that income level is one of the most significant determining factors of health. The Public Health Agency of Canada indicates in its second report on Canadians' health that as the level of income rises, Canadians are known to be less ill, have a longer life expectancy and better overall health (ASPC, 2013).

The end of the operation phase will lead to a gradual decrease in the number of workers. This downturn in workforce requirements could result in a decrease in income for some, and for others, job loss or change. Some employees may have more difficulty finding a job with the same salary level that they had at the mine. Worry associated with having to draw unemployment and loss of employment could lead to behavioural and health problems for affected workers and their families. Some of the health problems that occur could include an increase in alcohol and drug abuse. Through its communication program, Galaxy will notify their workers, ahead of time, of when they expect work to end, so that they can prepare themselves. Galaxy will also offer an Employee Assistance Program to provide closure transition support (worker reclassification assistance committee).

IMPACT ASSESSMENT

Application of the mitigation measures will minimize the potential impacts on the quality of life during the operation phase. Overall, the intensity of this impact is considered moderate. Its extent is regional, since the impact will be felt by Cree workers and the Cree **First Nations** of EIJB. The duration is medium since the impact may occur during the life of the mine, a period of approximately 18.5 years. The significance of the impact on the quality of life during the operation phase is considered to be **minor**.

Applying mitigation measures will also minimize the negative impacts on women, young people and elderly people in the Eastmain and Waskaganish communities during operation. Overall, the impact's intensity is considered low during operation since the developer will have had time to implement the various mitigation measures and confirm their effectiveness since the beginning of the construction phase. Its extent is regional since it affects the Cree communities of Eastmain and Waskaganish. Finally, the impact's duration is medium. Therefore, the significance of the impact on women, young people and elderly people in the affected communities during the operation phase is considered moderate. It should be noted, however, that this impact has a positive aspect in terms of the increased quality of life associated with obtaining long-term employment and contracts.

REHABILITATION PHASE

SOURCES OF IMPACT

- Infrastructures dismantlement.
- Pit rehabilitation.
- Transportation and traffic.
- Economic development and presence of workers.

MITIGATION MEASURES

VIE 04, VIE 06 to VIE 10, VIE 12 to VIE 17, VIE 19 to VIE 22, ELR 05, 07, ELR 08 and PER 01 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

During the rehabilitation phase, there will be more or less the same number of jobs available at the mining site as there were for the construction phase. Just as for the operation phase, the impacts on quality life – primarily integration and social problems – will continue to be felt during the rehabilitation phase.

However, this phase will be characterized by substantial income and significant monetary gains. The type of work planned for the rehabilitation phase, however, primarily pertains to earthwork and landscaping, which generally requires hiring local suppliers. Thus, the rehabilitation phase of the project should have a beneficial impact on the region in terms of labour and purchasing goods, services and materials. Cree workers and suppliers will be able to maintain good levels of income during this period, which will in turn help them to maintain a good quality of life.

IMPACT ASSESSMENT

Application of the mitigation measures will minimize the potential impacts on the quality of life. The intensity is considered to be low, since the operation phase will have resolved the most concerning issues. Its extent is regional, since it affects all Cree mine workers, as well as the EIJB's Cree communities. It will be of short duration, as the impact will only be felt during the rehabilitation phase. Thus, the significance of the impact on the quality of life during the rehabilitation phase is considered to be **minor**.

POST-REHABILITATION PHASE

Site closure will allow a portion of the territory affected by the mine to be re-used and re-appropriated. These activities will have a positive effect since they will mitigate the negative effects associated with the sense of loss felt with presence of the mine's remains and changes made to the territory.

7.4.4.2 MATAGAMI

OPERATION PHASE

SOURCES OF IMPACT

- **Transportation and traffic in Matagami, including increased activity at the transshipment station.**
- **Economic development and presence of workers.**

MITIGATION MEASURES

Mitigation measures AIR 02, NOR 11, SON 01, CIR 01, CIR 08 to CIR 15 and VIE 01 must be applied. These are described in Table 7-5.

DESCRIPTION OF THE IMPACT

Increased activity at the transshipment station will result in increased truck traffic. The transshipment station belonging to the City of Matagami is located approximately 4 km southwest of the urban core of Matagami, on Route 109. There is a 3-km rail network, 250,000 m² of storage space and almost as much land ready for development (Matagami Transshipment Station, 2021).

However, since the nearest residential neighbourhoods are located 400 m from the road and about 4 km from the transshipment station, the contribution of the traffic to the noise generated by the project should not particularly inconvenience the residents. In addition, a forest cover separates the road and the transshipment station from the town of Matagami, thus attenuating the range of the noise. In addition, transportation is mainly planned to take place during the day.

At the beginning of the operation phase, users of the Billy-Diamond highway, which becomes Route 109 in Matagami, may have to adapt to the increased number of heavy vehicles travelling to the transshipment centre because of the increased risk of accidents, dust and pollution caused by these trucks. As with the mine site, the transportation management plan and the communications management plan will also apply to travel between the transshipment centre and the mine site.

IMPACT ASSESSMENT

The intensity of the impact on the quality of life in Matagami is considered low. During the first few years of operation, citizens will have to adapt to the nuisances caused by the increase in traffic. However, they are already familiar with heavy vehicle traffic on the Billy-Diamond highway and Route 109. Moreover, the transshipment site is located at a good distance (4 km) from the city.

Its extent is local since the effects are likely to be felt by users of the Billy-Diamond highway and Route 109 mainly in Matagami. The duration is medium, since the period required for road users to adapt may be spread over a few years. Thus, the significance of the impact on the quality of life in Matagami is considered to be minor.

7.4.5 LOCAL AND REGIONAL ECONOMY

CONSTRUCTION PHASE

SOURCE OF IMPACT

— Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures ERL 01 à ERL 06 ELR09 to **ELR 15, ELR 17, ELR 18 and VIE 07** must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

Mine construction could have significant economic benefits for Cree and James Bay businesses (increase in local demand for goods and services). In fact, numerous services necessary at each construction stage may be able to be subcontracted to local or regional businesses. Furthermore, the construction phase needs may provide opportunities for joint ventures.

The project currently represents an investment of more than approximately $**362.5** million. Of that amount, purchases within Québec could total approximately $**290** million during the construction phase. Area socioeconomic stakeholders that were met emphasized the importance of the project's economic benefits for the Cree and James Bay communities, most particularly in terms of benefits for the businesses. It is also important to highlight the additional revenue this project will generate for the Grand Council of the Crees and the **Cree Nation** of Eastmain.

Numerous improvement measures have been proposed to favour awarding contracts to local and regional businesses, particularly a purchasing policy that would prioritize local and regional businesses in calls for bids and a memorandum of understanding about the consequences and advantages of Cree participation (for royalties and jobs). Business opportunities associated with mine construction will have a positive impact on maintaining and developing Cree businesses and on EIJB communities' economies. **Galaxy wants to create a partnership with the Cree Nation of Eastmain, particularly by developing a protocol for the participation of Cree workers, including women and young workers.**

The construction expenses of the mine will also contribute to the creation of jobs, particularly for EIJB communities and most especially for Eastmain. The work will be spread over an 18-month period and will require **many workers. The number of employees required will not be constant during the construction phase.** It should be highlighted that many Cree and James Bay workers acquired good experience in the construction industry, primarily within the framework of Hydro-Québec's Eastmain-1 and Eastmain-1-A–Sarcelle–Rupert projects.

Many improvement measures have been proposed to favour hiring Cree workers, **including women and young workers,** and to reduce obstacles or constraints on employment (e.g., worker integration mechanisms such as information sessions and a Cree job counsellor, etc.), particularly through the Impact and Benefit Agreement (IBA) being developed with the Eastmain **Cree Nation**.

Furthermore, participation in mine construction will empower EIJB community members to improve their job skills, employability and qualifications. **It should be noted that the employment rate of Cree women is higher than that of men and, as a result, obtaining a job during mine construction does not automatically represent a positive impact for women. However, for women who wish to work in non-traditional fields, it represents an opportunity for employment and skills development. Considering that compensation for jobs during the construction phase may be higher than that of some jobs offered in the community, the impact may be financially beneficial at the individual level, although it may be a drain on skilled workers from the communities to the mine site (see the operation phase impact assessment).**

Experience acquired during the construction phase will be helpful to those who, when construction is complete, wish to find a new job on the job market. Furthermore, job prospects, not only at this mine but in other mining extraction projects in the region, could entice some of the youth to sign up for training or pursue their education toward a career or trade.

Several measures have been proposed with the goal of allowing Eastmain community members to acquire the skills necessary for the jobs offered during the construction period. In this regard, Galaxy proposes, in partnership with the Cree Human Resources Department (CHRD) and the Cree School Board (CSB), to develop training and development programs to fill positions at the mine. **These will begin after provincial and federal environmental approvals are issued.** Lastly, one of the project's positive effects on businesses and the workforce is associated with the development and enhancement of local and regional expertise.

IMPACT ASSESSMENT

For all of the aforementioned reasons, the project impact associated with the local and regional economy during the construction phase is deemed to be **positive**.

OPERATION PHASE

SOURCE OF IMPACT

— Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures ERL01 to ERL08 must be applied. They are set out in Table 7-5.

DESCRIPTION OF THE IMPACT

The project will generate economic benefits in the Cree community during the operation phase. Annual operating expenses will be approximately $**118** million. Not only could the mine's activities help with business development for existing local companies, they could also help create new businesses to meet the mining company's needs for goods and services (such as professional services, equipment, repair services, etc.).

Furthermore, we should recall that with getting jobs at the mine and having contracts awarded to EIJB businesses, we can speculate that the active Cree population's income will increase, which would lead to an increase in individuals' personal spending and ultimately stimulate the communities' economies. Business opportunities associated with mine operation will have a positive impact on maintaining and developing Cree businesses and on EIJB communities' economies.

The mine operation is expected to create **direct employment. Over the first five years, the number of workers is expected to be between 95 and 270. In addition, indirect jobs**, for a period of about **18** years, could be partially filled by members of the Cree communities. For those who do get a job at the mine, it would be safe to speculate that their quality of life, and that of their families, will improve. The participation of local workers in the project will have a positive impact on the labour market not only of the EIJB communities, **but also of sub-groups of these communities, especially women and young workers, through the implementation of measures to encourage their hiring**.

Participation in mine operation will empower many EIJB community members to improve their job skills, employability and qualifications. Experience acquired during the construction phase will be helpful to those who, when operations end, wish to find a new job on the job market.

Job prospects, not only at this mine but in other mining extraction projects in the region, could entice some of the youth to sign up for training or pursue their education toward a career or trade. Cree who have worked at the mine, and have acquired new professional and social skills, will be able to act as new positive role models and encourage youth to pursue their education. One of the positive effects that the project will have on the labour force is associated with the employability of community workers, as well as the development and enhancement of local and regional expertise.

As in the construction phase, Galaxy intends to propose, in partnership with the DCHR and the Cree School Board, the development of specialized training and development programs to fill mine positions. These programs may be offered in Cree communities and conducted by Galaxy depending on the progress of the project and the certainty of its completion. All stakeholders involved are discussing the best approaches to recommend and are working to find appropriate solutions to the challenges of scheduling, location and language barriers. The updated feasibility study currently underway will specify the types of jobs and training required.

In addition, discussions are underway with the Cree Nation of Eastmain specifically concerning the recruitment and training of Cree workers. If objectives are identified and defined for the hiring and training processes, they will be included in the Impact and Benefit Agreement (IBA). Galaxy is committed to working with the Cree Nation of Eastmain to secure as many Cree recruits as possible.

To this end, workshops could be organized to present employment and training opportunities and to encourage people to create and submit CVs. These actions will be the subject of a communication plan that will be drafted together with the Cree Nation of Eastmain. As part of this communication plan, a list of foreseeable jobs will be circulated after the feasibility study is updated and the IBA is signed. The plan will also be sent to the JBNQA Administrator.

Galaxy also plans to implement specific activities to promote employment and training in the mining industry among young people, including presentations in high schools and CEGEPs to showcase job opportunities. This will allow young people in the region to benefit from the job and contract opportunities offered by Galaxy at both the mine and the Matagami transshipment centre, and thus remain in the region. Discussions will be held with representatives of the educational institutions and all stakeholders involved to ensure that the targeted objectives, which may change over time, are met.

However, socio-economic stakeholders consulted in the context of mining projects emphasize the issue of school dropout associated with jobs requiring few or no qualifications. Galaxy will be sure to stress the importance of obtaining professional qualifications to take advantage of the jobs offered. Galaxy will also be sure to inform young people of all the opportunities that come with graduation and employment in the mining sector, including for girls. Promoting opportunities for students to work in the mining sector, as well as with local and regional suppliers, will encourage them to continue their education in order to take advantage of employment opportunities, and will also encourage them to stay in the region.

By helping to increase their employment rate and income, the project can benefit young workers. According to the INSPQ (2014), job creation among young people is a major challenge for development projects among the Cree population in order to ensure the sustainability of their communities. Investments in education also help boost self-esteem and slow down migration to urban areas.

Since the labour pool in the Eastmain community is limited, the project could place a strain on human resources, which would be an obstacle for other employers in this community in terms of recruiting and/or retaining personnel. It is also possible that businesses and services would need to adjust their salaries and social benefits in an effort to prevent their staff members from leaving. In fact, the appeal of good job conditions could lead to Cree businesses losing their employees to the mine. People will see the opportunity to increase their income and thus improve their quality of life.

The "fly in, fly out" system, common in the mining sector, allows workers to fly to work, rather than having their families move close to their place of work. The geographically isolated location of the Galaxy mine site also makes this system attractive to workers. To recruit the candidates it needs, the company will offer the system that best meets its labour needs.

When equally qualified people apply, Galaxy intends to prioritize the Cree workforce first, and then the regional workforce, for the positions it needs to fill. The same applies to contractors and suppliers of services or goods. Measures to prioritize employment and businesses at the local and regional level (Cree and non-indigenous communities) are planned and will also contribute to the project's positive impact on the economy of the City of Matagami.

An increased workforce may also be needed to develop the transshipment station and to receive concentrate on a daily basis in connection with this increased activity. The local economy of Matagami could also be stimulated due to the necessities of maintaining trucks and the needs of the drivers (food, lodging). Services and shops will see an increase in their business. Thus, the transportation and transshipment of concentrate in Matagami should be a beneficial contribution to the local and regional economy. The Galaxy project will allow for the development of transshipment infrastructure in Matagami, which will have significant repercussions for the city. Also, among the improvement measures suggested by the City of Matagami, Galaxy will participate in an economic benefits maximization committee (COMAX), so that the region can take maximum advantage of the project's repercussions.

In response to concerns about the boom and bust phenomenon and its effects, Galaxy will work with the community to ensure that the community benefits from positive economic and social impacts. Toward the end of the operation phase, an assistance program will be provided to help support employees during the transition to closure (worker reclassification assistance). Furthermore, as highlighted, Galaxy will regularly update forecasts regarding the length of operation and announce the end of mine operation ahead of time, in order decrease expectations and prepare workers.

IMPACT ASSESSMENT

Just as with the construction phase, the project impact associated with the local and regional economy during the rehabilitation phase remains **positive**.

REHABILITATION PHASE

SOURCE OF IMPACT

— Economic development and presence of workers.

MITIGATION MEASURES

Mitigation measures ERL01, and ELR03 to ERL06 must be applied. They are set out in Table 7-5.

DESCRIPTION OF IMPACT

During the rehabilitation phase, mining activities will decrease considerably compared to the operation phase. However, some businesses may still be awarded contracts associated with the rehabilitation activities, most notably work to dismantle the infrastructure and restore/redevelop the land.

Within the context of its rehabilitation activities, Galaxy will continue to favour awarding contracts from requests for proposals to businesses within the region – primarily Cree – when skills and price are competitive. Mine rehabilitation will also have an impact on jobs because it will require workers to be hired. Galaxy will prioritize hiring workers from the region for site requalification.

IMPACT ASSESSMENT

As with the construction and operation phases, the project impact associated with the local and regional economy during the rehabilitation phase remains **positive**.

POST-REHABILITATION PHASE

During the post-rehabilitation phase, activities at the mine will have ceased. Thus, apart from monitoring the site, no other activities are likely to have any impact on the economy.

7.4.6 HERITAGE AND ARCHAEOLOGY

DURING THE CONSTRUCTION PHASE

SOURCE OF IMPACT

— Land preparation and infrastructure construction.

MITIGATION MEASURES

Mitigation measure ARC01, **ARC 02** and standards NOR17 to NOR19 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

During the construction phase, the operations likely to impact historical, cultural and archaeological heritage are connected to land preparation and infrastructure construction. It should be recalled that there are no protected areas in the study area and because of this, natural heritage is not considered in the current component.

Several construction activities, like topsoil removal and land preparation, are likely to expose archaeological or historic ruins. An archaeological potential study was conducted to determine the areas of interest related to the remains associated with the ancient human presence. To date, one prehistoric archaeological site associated with Amerindian occupation is currently known due to an incidental discovery at the km 381 truck stop (FbGg-1) located **outside the project site**, on the edge of the hill selected for mining development. In addition, 27 areas of archaeological potential have been identified in the archaeology study area. The likelihood of finding ruins of archaeological or historical interest therefore exists. **Archaeological survey work is planned for the end of July 2021. The archaeological potential in the areas that may be impacted will thus be clarified. Furthermore, Galaxy will communicate any artifact discovery to the RE2 tallyman, the Council of the Cree Nation of Eastmain and the Cree Nation Government Department of Culture and Language**.

Galaxy will make workers aware of their obligations regarding incidental archaeological discoveries and will apply the standards and regulations in effect.

IMPACT ASSESSMENT

Due to its legal protection under the Cultural Heritage Act, and because of the importance it holds for First Nations, this component is important for the community. The degree of intensity of this impact is considered low because the mitigation measures that will be implemented, **including results of archaeological surveys,** will allow the site to be documented before construction. The extent of the impact will be minimal since it would be experienced only on a few sites with remains. The duration of the impact will be long. The importance of the impact on heritage and archaeology during the construction phase is **minor**.

OPERATION PHASE

SOURCES OF IMPACT

— Presence and pit mining.

MANAGEMENT OF PROCESS PLANT FEED MATERIAL, OVERBURDEN AND WASTE ROCK MITIGATION MEASURES

Mitigation measure ARC01 and **ARC 02** and standards NOR17 to NOR19 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

During the operation phase, the activities likely to impact historical, cultural and archaeological heritage are related to presence and pit mining, as well as the management of the economic material, the unconsolidated deposits and waste rock. Just like during the construction phase, Galaxy will make workers aware of their obligations regarding incidental archaeological discoveries and will apply the standards **and regulations in effect**.

IMPACT ASSESSMENT

Just like during the construction phase, the degree of severity of this impact is considered low because of the mitigation measures that will be implemented, which among other things will allow the site to be documented before construction. The extent of the impact will be minimal since it wouldn't be experienced at many sites with remains and the duration will be long. The importance of the impact on heritage and archaeology during the construction phase is **minor**.

REHABILITATION PHASE

Since rehabilitation work will not open new areas, there is no impact on heritage and archaeology.

POST-REHABILITATION PHASE

After the site rehabilitation, impacts will be non-existent since there will not be mining operations likely to modify the heritage and archaeology.

7.4.7 LANDSCAPE

DURING THE CONSTRUCTION PHASE

SOURCE OF IMPACT

— Land preparation and infrastructure construction.

— Transportation and traffic.

MITIGATION MEASURES

Measures SUR 01 to SUR 04, AIR 01, AIR 03 and AIR 05 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

The anticipated impact on the landscape is mostly related to the transformation of the character of the landscape and changing the observer's visual range. The impact is caused by land preparation and infrastructure construction work. During the construction phase, operations will alter the natural character of a large swath of the project site's landscape. Transportation and dust generated by construction work will cover the project site during land preparation.

IMPACT ASSESSMENT

The application of mitigation measures to control the footprint of the work will minimize the potential impact on the landscape and the visual range during construction phases. The severity of impact is considered low. The extent is local since the impact on the visual range will be limited to the local study area. The duration of the impact is short because of the length of the construction period. Overall, the severity of the impact on the landscape during the construction phase is considered **minor**.

OPERATION PHASE

SOURCE OF IMPACT

- Presence and mining the pit.
- Other infrastructure in operation.
- Management of ore, unconsolidated deposits and waste rock.
- Transportation and traffic.

MITIGATION MEASURES

Measures SUR 01 to SUR 04, AIR 01, AIR 03 and AIR 05 must be applied. They are indicated in Table 7-5.

DESCRIPTION OF THE IMPACT

In the operation phase, the addition of the pit and rock stockpiles will transform the nature of the landscape significantly and on a large scale. Transportation and the dust created will be concentrated between the pit, rock stockpiles and buildings. The highest planned building will rise **to 27 m above** the site. Its roof height will reach the same level as the tops of the tallest hills on the plains.

Operation of the pit and waste rock stockpiles **will** continue throughout the phase. **Extraction operations in the pit will** result in the removal of a large part of an elevated rocky outcrop. After the first few years, operations will be on the pit floor, several metres below ground level. The rock wall, south of the pit and facing north, will look out over the area like the elevated rocky outcrop that the pit will have replaced. **The waste rock and tailings storage facilities (WRTSFs) will have respective heights of 53 m for the west stockpile (elevation 260 m), 83 m for the northeast stockpile (elevation 290 m), 62 m for the southwest stockpile (elevation 270 m) and 68 m for the east stockpile (elevation 280 m)**. The flat tops of **the four stockpiles will dominate** the hills of the landscape. The **organic** and unconsolidated waste rock stockpile will be paired with the **north** flank of **the northwest waste rock and tailings stockpile and will rise to approximately 16 m (elevation 220 m**). The ore stockpile will be approximately **8 m high (elevation 215 m)**.

The upper parts of the buildings, the southern rock wall and the stockpiles will characterize the landscape and will become visual landmarks. From several observation points, the tree line or topography may obscure all or part of the project components. However, note that depending on the dynamics of forest fires, existing vegetation can change and the visual integration of the installations can be altered accordingly.

The character of the landscape is essentially based on natural components. The installations and industrial aspect of the project contrasts with the landscape's natural appearance. However, the planned buildings will resemble the infrastructure of the nearby km 381 truck stop. The **WRTSFs will dominate** the landscape and their flat tops will create a new focal point in the landscape.

Observer groups in the study area are temporary fixed and mobile ones. There are no permanent residents in the study area. Note that the visual range of observers located in the valley area will not be altered due to the topography restricting the view of the project site.

Buildings will be located at a minimum distance of **6** km from permanent Cree camps and **about** 2 km from the km 381 truck stop. Standing in a clear foreground, the visual range of temporary fixed observers staying in the area will be altered at the intermediate plane (from 0.5 km to 3 km distance) and in the background (from more than 3 km away) by the projected buildings. **Most of them** will also be located **within a wildlife area** and at a distance of **a little more** than 2 km north of a valued area. Standing in a clear foreground, the visual field of temporary fixed observers visiting wildlife and protected areas will be altered **in the foreground (from 0 km to 0.5 km distance),** in the middle ground and in the background by the projected buildings.

The south wall of the projected pit will be located at a minimum distance of 6 km from permanent Cree camps and will not be visible from the km 381 truck stop. Standing in a clear foreground, the visual range of temporary fixed observers staying in the area will be changed in the background by the south wall of the projected pit.

The **closest** waste rock stockpiles will be located at a minimum distance of 5 km from permanent Cree camps **(northwest stockpile)** and **approximately 700 m** from the km 381 truck stop **(east stockpile)**. Standing in a clear foreground, and because of the relative height of the waste rock stockpile, the visual range of the temporary fixed observers staying in the area will be significantly altered in the middle range and in the background by the rock stockpiles. Also, **the east stockpile will be located within a wildlife area** and at a distance of **approximately 900 m** from a valued area. **The northeast stockpile will be adjacent to the same wildlife area.** Standing in a clear foreground, and taking into account the relative breadth of the stockpiles, the visual field of temporary fixed observers visiting the area will be significantly altered **in the foreground**, middle ground and background by the stockpiles.

Users taking the Billy-Diamond highway make up a large group of observers. In general, buildings will be located **about 400 m away (approximately 150 m for the closest building),** the south wall of the pit **about 300 m (at its maximum use) and the closest WRTSF (east) approximately 40 m**. Standing on the west side of the road, the visual field is deep at the road axis and its opening is limited. This visual range configuration is more typical from the project site and to the north. **However,** the visual field of mobile observers will be modified by the project components and operations **located near the Billy-Diamond highway**. Note that only the visual field of mobile observers travelling south toward the project site **will also be** affected by **these components**. However, standing in a clear foreground, the visual field will be changed in the middle ground and in the background by **the project components and operations that will exceed** the treetops or ground elevation.

In some places, the road's twists and turns, as well as high elevation from the project site, provide for significant views of project components more than 3 km away. The visual range of mobile observers will be altered by the project components in the background. Furthermore, the visual range of snowmobile trail and waterway users is typically significant at the main roadway and its opening is limited or obstructed by the terrain or tree growth. The visual range of these mobile observers will be little changed by the project components. The visual range of boaters on large water bodies prized for fishing, located more than 8 km from the project site and slightly concealed, have their view limited by the topography. The visual range of these mobile observers will be changed little or not at all in the background by taller sections of project components.

Note that the seamless integration of the project into its surroundings has been considered since the planning and design stage. **Although some** infrastructure will be built **near** the Billy-Diamond highway, a natural buffer zone will be maintained between **this road** and the infrastructure. This area includes vegetation and an elevated rock outcrop that will preserve the visual setting of the road at the project site.

The WRTSFs and the highest buildings, the tops of which will rise above the hills of the plains by a few dozen meters, will be the project component that can especially modify area the visual field of study area observers from observation points that have open, framed or partially obscured views of the site. However, note that rock stockpiles will only be able to change the visual range of observers from the moment they become visible beyond ground elevation or existing vegetation, which is destined to change quickly due to forest fires.

Visual simulations were performed based on the 2018 infrastructure configuration but were not updated with the new layout. According to these visual simulations, it is still possible to anticipate the effects of components of the project on the visual field of observers at the end of operations **before the site is returned to its natural state or the implementation of mitigation measures planned for the rehabilitation phase.** Photos make it possible to evaluate the most significant effects of the project on the landscape and on observers' visual field by comparing the current and future states of the site.

IMPACT ASSESSMENT

Considering the harmonious integration of the project starting from the planning and design stage, deploying mitigation measures to limit the construction work's footprint and revegetating the slopes of the **WRTSFs** will, as they are implemented over time, minimize the potential impact on the landscape during the operation phase. The presence of the WRTSFs and the pit will profoundly transform the character of the natural landscape. The severity of the impact is considered medium. **When the infrastructure is visible in the foreground of the visual field of Billy-Diamond highway users, the intensity of the impact would be considered high at certain points.** The extent is local since the visual field impact **will extend to the foreground, to the** medium range visual field and to the background. The duration of the impact is long term because of the permanency of the **WRTSFs** in the landscape. Overall, the significance of the impact on the landscape in the operation phase is considered **moderate and occasionally major**.

REHABILITATION PHASE

SOURCES OF IMPACT

— Infrastructures dismantlement.

REHABILITATION PHASE

SOURCES OF IMPACT

— Infrastructures dismantlement.
— Pit rehabilitation.
— Transportation and traffic.

MITIGATION MEASURES

Measures SUR 02, AIR 01, AIR 03 and PAY 01 must be applied, as well as standard NOR 01. They are indicated in Table 7-5.

DESCRIPTION OF IMPACT

During this phase, infrastructure dismantling, reshaping the top of the **WRTSFs** and site revegetation will progressively reduce the site's industrial nature and help restore the landscape to its original natural state. These operations will improve the visual appeal of the site and its components at a scale equal to the natural landscape and mitigate the effects on an observer's visual range. The transportation required to conduct the work will be temporary.

The conceptual restoration plan has been updated to reflect the optimization of the mine development plan. This update will be presented to the Councils of the Cree Nations of Eastmain and Waskaganish, and to the affected tallymen of the Eastmain community for their comments, suggestions and concerns. A detailed restoration plan will then be prepared in due course to take into account the comments of relevant government analysts and representatives of the surrounding communities. It should be noted that MERN consults with indigenous communities prior to granting mining leases. These consultations address the restoration plan in particular. Galaxy therefore plans to consult the affected Cree First Nations about its remediation plan to ensure that their comments and suggestions are incorporated and to prevent delays in issuing the mining lease.

IMPACT ASSESSMENT

The application of mitigation measures to monitor the work will minimize the potential impact on the landscape and the visual range during the rehabilitation phases. The severity of impact is considered low. The extent is local since the impact on the visual range will be limited to the local study area. The duration of the impact is short because of the length of the rehabilitation period. Overall, the severity of impact on the landscape during the construction phase is considered **minor**.

POST-REHABILITATION PHASE

After the restoration of the site, the revegetated rock stockpiles and the pit will remain, to the trained eye, a testament to the industrial past of the site's landscape. The impact on the landscape and on the observer's visual range is generally a positive one. Consequently, an impact assessment is not required.

7.4.8 COMPARISON OF IMPACTS ON THE HUMAN ENVIRONMENT 2018 VS. 2021

This section is intended to summarize the changes to the current description and assessment of impacts compared to those described in the 2018 EIA. Table 7-20 shows the human environment components of the study area and, according to the phase of the project, indicates the changes made to the description and assessment of impacts based on the 2018 and 2021 projects, where applicable.

Table 7-20 Comparison of the description and assessment of the project's impact on each of the human components of the local study area

Component	Phase	Change to the description of the impact	Impact significance according to the 2018 project	Impact significance according to the 2021 project
Current use of land and resources for traditional purposes	Construction, operation and restoration	– Enhanced description of impacts on the component – Analysis of impacts on the component done in two specific areas: project study area and area along the Billy-Diamond highway – Addition of mitigation measures UTT 05, UTT 06, CIR 03, CIR 07 to CIR 16, NOR 11, VIE 01, VIE 05 and VIE 15	Moderate	Moderate
Current use of land and resources for traditional purposes	Post-restoration	– Enhanced description of impacts on the component	Positive	Positive

Table 7-20 Comparison of the description and assessment of the project's impact on each of the human components of the local study area (cont.)

Component	Phase	Change to the description of the impact	Impact significance according to the 2018 project	Impact significance according to the 2021 project
Infrastructure	Construction and operation	– Enhanced description of impacts on the component – Addition of mitigation measures CIR 08 to CIR 10 – Withdrawal of mitigation measure VIB 01	Minor	Minor
Infrastructure	Rehabilitation	-	Minor	Minor
Perception of physical and natural environment	Construction	– Addition of the natural area to the component – Enhanced description of impacts on the component – Addition of mitigation measures CIR 01, CIR 02, CIR 05, CIR 06, VIE 15, VIE 22, SUR 03 and SUR 04 – Withdrawal of mitigation measure VIB 01	Minor	Minor, considering the short duration in the impact assessment Moderate according to the Cree users' assessment since they believe the duration of the impact will be long
	Operation	– Addition of the natural area to the component – Enhanced description of impacts on the component – Addition of mitigation measures CIR 01, CIR 02, CIR 05, CIR 06, VIE 15, VIE 22, SUR 03 and SUR 04 – Withdrawal of mitigation measure VIB 01	Minor	Moderate considering a local scope by Cree users
	Rehabilitation	– Addition of the natural area to the component – Addition of mitigation measures CIR 01, CIR 05, VIE 15, VIE 22, SUR 03 and SUR 04	Minor	Minor
Quality of Life	Construction	– Analysis of the impacts on the component for the Cree First Nations – Enhanced description of impacts on the component – Addition of mitigation measures UTT 02 to UTT 05, CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16, VIE 07 to VIE 22, ELR 05, ELR 06, ELR 13 and PER 01	Minor	Minor

Table 7-20 Comparison of the description and assessment of the project's impact on each of the human components of the local study area (cont.)

Component	Phase	Change to the description of the impact	Impact significance according to the 2018 project	Impact significance according to the 2021 project
Quality of Life (cont.)	Operation	– Analysis of the impacts on the component for the Cree First Nations – Enhanced description of impacts on the component – Addition of mitigation measures UTT 02 to UTT 05, CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16, VIE 07 to VIE 22, ELR 05, ELR 06, ELR 07, ELR 08, ELR 13 and PER 01	Moderate	Moderate
	Operation	– Analysis of the impacts on the component for the community of Matagami – Enhanced description of impacts on the component – Addition of mitigation measures AIR 02, NOR 11, SON 01, CIR 08 to CIR 15	Moderate	Minor
	Rehabilitation	– Addition of mitigation measures VIE 07 to VIE 10, VIE 12 to VIE 17, VIE 19 to VIE 22, ELR 05, ELR 07, ELR 08 and PER 01	Minor	Minor
Local and Regional Economy	Construction and operation	– Enhanced description of impacts on the component – Addition of mitigation measures ELR 09 to ELR 15, ELR 17, ELR 18 and VIE 07	Positive	Positive
	Rehabilitation	-	Positive	Positive
Heritage and Archaeology	Construction and operation	– Archaeological survey work planned for July 2021 – Addition of mitigation measure ARC 02	Minor	Minor
Landscape	Construction	-	Minor	Minor
	Operation	– Updated impact description and assessment	Moderate	Moderate to major
	Rehabilitation	– Updated impact description with details on the remediation plan	Minor	Minor

7.5 ASSESSMENT OF THE ANTICIPATED IMPACTS

An assessment of the project's anticipated residual impacts is summarized in Table 7-21 presented in the following pages.

Table 7-21 Assessment of residual impacts

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Physical environment								
Soil	Construction	• Site preparation and infrastructure construction. • Hazardous and waste materials management.	• Risk of soil erosion. • Risks of soil contamination due to the potential leak of petroleum products or accidental spills of hydrocarbons or other products.	SUR 01 to SUR 04, QUA 01 to QUA 04, QUA 08 to QUA 13, NOR 02 to NOR 04 and NOR 09	Low	Local	Short	Minor
	Operation	• Management of economic material, overburden and waste rock. • Hazardous and waste materials management.	• Risks of soil contamination due to the potential leak of petroleum products or accidental spills of hydrocarbons or other products.	SUR 01 and SUR 02, QUA 01 to QUA 05, QUA 10, QUA 12, NOR 02 to NOR 04, NOR 09 and NOR 10	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Hazardous and waste materials management.	• Risk of soil erosion. • Risks of soil contamination due to the potential leak of petroleum products or accidental spills of hydrocarbons or other products.	SUR 02, QUA 01 to QUA 04, QUA 07, QUA 08, QUA 12, NOR 01 to NOR 04, and NOR 10	Low	Local	Short	Minor
Hydrogeology	Construction	• Site preparation and infrastructure construction. • Water management.	• Alteration of runoff flow patterns, surface and groundwater on the periphery of infrastructure.	SUR 01, SUR 02, QUA 01 to QUA 04, QUA 10, and QUA 11 **to QUA 13**	Low	Isolated	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management.	• Water table drawdown due to pit dewatering. • Alteration of runoff flow patterns, surface and groundwater on the periphery of infrastructure.	QUA 06, **QUA 14** and NOR 06	Moderate	Local	Long	Moderate
	Rehabilitation and post-rehabilitation	• Infrastructure dismantling Pit rehabilitation. • Water management.	• Natural flooding of pit. • Alteration of runoff flow patterns, surface and groundwater on the periphery of infrastructure.	QUA 06	Moderate	Local	Long	Moderate
Hydrological regime	Construction	• Site preparation and infrastructure construction. • Water management.	• Localized change in the natural flow of surface waters. • Possible increase in surface runoff due to a decreased infiltration caused by soil compaction.	SUR 01, SUR 03, SUR 04, QUA 07, QUA 09, QUA 11, NOR 01, NOR 05, NOR 07, NOR 14, and NOR 15	Low	Isolated	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management.	• Encroachment of drainage basins in the study area by project infrastructure decrease their surface area. • Changes in mean and low flows of watercourses in the study area due to pit dewatering. • Changes in the water levels of watercourses in the study area.	SUR 01, QUA 05, UTT 03, NOR 01, NOR 05, NOR 07, NOR 08, NOR 14, and NOR 14	Moderate	Local	Long	Moderate
	Rehabilitation and post-rehabilitation	• Infrastructure dismantling Pit rehabilitation. • Water management.	• Localized change in the natural flow of surface waters.	SUR 03, QUA 07, QUA 09, QUA 11, and NOR 01	Moderate	Local	Long	Moderate

Table 7-21 Assessment of residual impacts (cont.)

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Water and sediments	Construction	• Site preparation and infrastructure construction. • Water management. • Hazardous and waste materials management. • Transportation and traffic.	• Risk of change in the quality of water and sediments related to the spreading of ice melters in the winter. • Risks of contamination of water and sediments due to the potential leak of petroleum products or accidental spills of hydrocarbons or other products.	**SUR 01, SUR 03, SUR 04,** QUA 01 to QUA 04, QUA 08 to QUA 13, NOR 02 to NOR 04, and NOR 07 to NOR 09	Low	Local	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management. • Hazardous and waste materials management. • Transportation and traffic.	• Risk of contamination of water and sediments by metal leaching and by the ingress of contaminated water under the waste rock stockpile. • Risks of contamination of water and sediments due to the potential leak of petroleum products or accidental spills of hydrocarbons or other products.	QUA 01 to QUA 06, QUA 12, **QUA 13 and QUA 15**, NOR 02 **to** NOR 04, NOR 06, and NOR 09	Low	Local	Moderate	Minor
	Rehabilitation and post-rehabilitation	• Infrastructure dismantling Pit rehabilitation. • Water management. • Hazardous and waste materials management. • Transportation and traffic.	• Risk of changes in the quality of water and sediments related to the spreading of ice melters in the winter. • Risk of contamination of groundwater by metal leaching and by the ingress of contaminated water under the waste rock stockpile. • Risks of groundwater contamination due to the potential leak of petroleum products or accidental spills of hydrocarbons or other products.	**SUR 01, SUR, 03, SUR 04,** QUA 01 to QUA 04, QUA 07, QUA 08, QUA 10 to QUA 12, SUR 03, NOR 01 to NOR 04, NOR 09, and NOR 10	Low	Local	Short	Minor
Atmosphere	Construction	• Site preparation and infrastructure construction. • Hazardous and waste materials management. • Transportation and traffic.	• Deterioration of the quality of the atmosphere by gaseous compounds and total particulate matter limited to the site and its immediate environment.	AIR 01 to AIR 05, and NOR 11	Low	Local	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Hazardous and waste materials management. • Transportation and traffic.	• Increase in concentrations of particulate matter and metals in the air. • Increase in greenhouse gas emissions.	AIR 01 to AIR 05, and NOR 11	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Pit rehabilitation. • Hazardous and waste materials management. • Transportation and traffic.	• Deterioration of the quality of the atmosphere by gaseous compounds and total particulate matter limited to the site and its immediate environment.	AIR 01 and AIR 02, and NOR 11	Low	Local	Short	Minor
Artificial light at night	Construction	• Site preparation and infrastructure construction. • Transportation and traffic.	• Temporary emission of artificial light into the sky and work site limits, which is likely to disturb nocturnal landscapes and have an impact on the biological and social environments on the periphery.	LUM 01 to LUM 03	Low	**Isolated**	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Transportation and traffic.	• Changes in light at night by adding artificial light could cause local changes in the brightness of the sky and generate light trespass.	LUM 01 to LUM 03	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Transportation and traffic.	• Temporary emission of artificial light into the sky and work site limits, which is likely to disturb nocturnal landscapes and have an impact on the biological and social environments on the periphery.	LUM 01 to LUM 03	Low	Local	Short	Minor

Table 7-21 Assessment of residual impacts (cont.)

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Physical environment (cont.)								
Ambient noise	Construction	• Site preparation and infrastructure construction. • Transportation and traffic.	• Increased ambient noise levels at the work site.	SON 01, **SON 02** and NOR 12	Low	Local	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Transportation and traffic.	• Increased ambient noise levels due to mining activities.	SON 01 to **SON 03**, and NOR 12	Low	Local	Short	Minor
	Rehabilitation	• Infrastructure dismantling Pit rehabilitation. • Transportation and traffic.	• Increased ambient noise levels.	SON 01, **SON 02** and NOR 12	Low	Local	Short	Minor
Vibrations and overpressure	Construction	• Site preparation and infrastructure construction.	• Vibrations and overpressure generated during blasting when the construction quarry is in operation.	VIB 01 to VIB 04 and NOR 13	Low	Local	Short	Minor
	Operation	• Presence and operation of the pit.	• Vibrations and overpressure generated during blasting when the pit is in operation.	VIB 01 to VIB 04 and NOR 13	Low	Local	Short	Minor
	Rehabilitation	• No impact.						
Biological environment								
Vegetation and wetlands	Construction and operation	• Site preparation and infrastructure construction. • Presence and operation of the pit. • Management of economic material, overburden and waste rock. • Hazardous and waste materials management. • Transportation and traffic.	• Direct alteration and loss of natural environments (land and wetland environments) as a result of the work. • Indirect impacts on plant communities preserved through development of the site and planned infrastructure.	VEG 01 to VEG 07, SUR 01 to SUR 04, QUA 01 to QUA 05, QUA 10 to QUA 12, NOR 02 to NOR 04, NOR 10 and NOR 15	Moderate	Local	Moderate	Moderate
	Rehabilitation	• Transportation and traffic. • Infrastructure dismantling	• Potential introduction of invasive alien plant species.	VEG 02, VEG 03 and VEG 06, QUA 01 to QUA 04, QUA 10 to QUA 12 NOR 02 to NOR 04 and NOR 10	Overall positive impact			
Large fauna	Construction and operation	• Site preparation and infrastructure construction. • Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Hazardous and waste materials management. • Transportation and traffic. • Economic development and presence of workers.	• Incidental mortality of large fauna individuals that may occasionally occur due to collisions with vehicles during preparation, construction and operation work. • Alteration of the natural behaviour of large fauna and its movements.	SUR 01 to SUR 04, FAU 03, FAU 05, **FAU 08.** SON 01, CIR 01 to CIR 03 and LUM 01 to LUM 03	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Transportation and traffic. • Economic development and presence of workers.	• Alteration of the natural behaviour of large fauna and its movements.	FAU 03 and FAU 05, SON 01, CIR 01 to CIR 03 and LUM 01 to LUM 03	Low	Local	Short	Minor

Table 7-21 Assessment of residual impacts (cont.)

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Biological environment (cont.)								
Small fauna and herpetofauna	Construction and operation	• Site preparation and infrastructure construction. • Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management. • Hazardous and waste materials management. • Transportation and traffic.	• Loss of approximately **450 ha** of land and wetland habitat specific to small fauna and herpetofauna. • Mortality of small fauna and herpetofauna individuals and small mammal species. • Risks of natural environment contamination, mainly because of the potential leak of petroleum products or accidental spills from equipment. • Disturbance of small fauna and herpetofauna individuals, mainly due to noise, nighttime lighting, dust, vibrations and human presence. • Risks of collision related to site traffic.	SUR 01 to SUR 04, QUA 01 to QUA 05, QUA 07 to QUA 13, AIR 01, AIR 02, LUM 01 to LUM 03, SON 01, VEG 01, VEG 02, FAU 02 and FAU 05, NOR 02 to NOR 05, NOR 08, NOR 09 and NOR 14	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Water management. • Hazardous and waste materials management. • Transportation and traffic.	• Disturbance of small fauna and herpetofauna individuals, mainly due to noise, nighttime lighting, dust, vibrations and human presence. • Risks of collision related to site traffic.	SUR 02, SUR 03, QUA 01 to QUA 04, QUA 07 to QUA 13, AIR 01, AIR 02, LUM 01 to LUM 03, SON 01, VEG 02, FAU 01 and FAU 05, NOR 01 to NOR 05, NOR 08, NOR 09 and NOR 14	Low	Local	Short	Minor
Ichthyofauna	Construction	• Site preparation and infrastructure construction. • Water management. • Hazardous and waste materials management. • Transportation and traffic.	• Risk of changes to the natural flow of water that may alter fish habitat to a certain degree. • Risk of accidental spills of petroleum hydrocarbons associated with machinery use.	**FAU 01**, SUR 01, SUR 03, SUR 04, QUA 01 to QUA 04, QUA 07 to QUA 13, NOR 02 to NOR 05, NOR 09 and NOR 13 to NOR 16	Low	Isolated	Short	Minor
	Operation	• Presence and operation of the pit. • Water management. • Hazardous and waste materials management.	• Loss of fish habitat. • Risk of accidental spills of petroleum hydrocarbons associated with machinery use.	**FAU 01**, SUR 01, SUR 03, SUR 04, QUA 01 to QUA 04, QUA 06 to QUA 13, NOR 02 to NOR 09 and NOR 13 to NOR 16	Low	**Isolated**	**Long**	Minor
	Rehabilitation and post-rehabilitation	• Infrastructure dismantling Water management. • Transportation and traffic.	• Limited change to the natural flow of surface waters and increase in suspended solids in water. • Risk of accidental spills of petroleum hydrocarbons associated with machinery use.	SUR 02 to SUR 04, QUA 01 to QUA 04, QUA 07 to QUA 13 and NOR 01 to NOR 09	Low	Isolated	Long	Minor
Avifauna	Construction and operation	• Site preparation and infrastructure construction. • Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management. • Transportation and traffic.	• Loss of approximately **450 ha** of land and wetland habitat specific to avifauna. • Risk of incidental bird mortality due to incidental take. • Risks of collision related to site traffic. • Mortality of avifauna individuals. • Alteration of the natural behaviour of birds and their movements. • Disturbance of avifauna individuals, mainly due to noise, nighttime lighting, dust, vibrations and human presence. • Risks of natural environment contamination, mainly because of the potential leak of petroleum products or accidental spills from equipment.	SUR 01 to SUR 04, FAU 02, **FAU 06, FAU 07**, SON 01, LUM 01 to LUM 03, QUA 05, QUA 09, QUA 08, NOR 07 to NOR 09, NOR 13, NOR 14 and VEG 01	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Transportation and traffic.	• Alteration of the natural behaviour of birds and their movements.	SUR 01, SUR 02, SUR 03, NOR 01, FAU 02, SON 01, LUM 01 to LUM 03, QUA 07, QUA 08, NOR 14 and VEG 01	Low	Local	Short	Minor

Table 7-21 Assessment of residual impacts (cont.)

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Biological environment (cont.)								
Bats	Construction and operation	• Site preparation and infrastructure construction. • Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Transportation and traffic.	• Direct and indirect habitat loss. • Potential mortality of tree bat species if present during deforestation activities. • Disturbance of wetlands (peatlands) potentially resulting in greater movements to alternative feeding sites. • Changes to the habitat structure potentially changing bats' use of the area. • Disturbance of local bat populations, mainly due to noise, nighttime lighting, dust, vibrations and human presence. • Risks of natural environment contamination, mainly because of the potential leak of petroleum products or accidental spills from equipment.	SUR 01, SUR 02, AIR 02, SON 01, VEG 02, FAU 02 and FAU 04, NOR 07 to NOR 09 and NOR 13	Low	Local	Moderate	Minor
	Rehabilitation	• Infrastructure dismantling Transportation and traffic.	• Disturbance of local bat populations, mainly due to noise, nighttime lighting, dust, vibrations and human presence. • Risk of bat mortality that may occur during the dismantling of buildings, wells or exploration drifts used as roosts by bats (day and/or maternity and/or winter roost).	SUR 02, AIR 02, SON 01, VEG 02 and FAU 04	Low	Local	Short	Minor
Social environment								
Current use of land and resources for traditional purposes	Construction	• Site preparation and infrastructure construction. • Transportation and traffic. • Economic development and presence of workers.	• Temporary disruption of the traditional activities of Cree users on territory in the study area. • Loss of use of portions of the territory where mining infrastructure will be located for the practice of certain traditional activities (e.g., berry picking and beaver trapping).	UTT 01 to UTT **06**, CIR 01, CIR 02,CIR 04, **CIR 07, CIR 16, VIE 05,** AIR 01 to AIR 05, SON 01, LUM 01 to LUM 03 and VIB 01 to VIB 04	Moderate	Local	Short	Moderate
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management. • Transportation and traffic. • Economic development and presence of workers.	• Disruption of the traditional activities of Cree users on territory in the study area. • Loss of use of portions of the territory where mining infrastructure will be located for the practice of certain traditional activities (e.g., berry picking and beaver trapping).	UTT 01 to UTT **06**, CIR 01, CIR 02, CIR 04, **CIR 07, CIR 16, VIE 05,** AIR 01 to AIR 05, SON 01, LUM 01 to LUM 03 and VIB 01 to VIB 04	Moderate	Local	Moderate	Moderate
	Rehabilitation	• Infrastructure dismantling Water management. • Transportation and traffic. • Economic development and presence of workers.	• Disruption of the traditional activities of Cree users on territory in the study area.	UTT01 to UTT04, CIR01, CIR02 and CIR04, AIR 01 to AIR 05, SON 01, LUM 01 to LUM 03 and VIB 01 to VIB 04	Low	Local	Short	Minor
Current use of land and resources for traditional purposes along the Billy-Diamond highway	**Construction**	• **Transportation and traffic.**	• **Temporary disruption of the traditional activities of Cree users along the Billy-Diamond highway.** • **Distrubances of Cree users by noise and dust and increased risk of accidents.**	**UTT 01, UTT 02, CIR 01, CIR 03, CIR 08 to 15, SON 01, VIE 01, VIE 05, VIE 15, NOR 11**	**Low**	**Regional**	**Short**	**Minor**
	Operation	• **Transportation and traffic.**	• **Temporary disruption of the traditional activities of Cree users along the Billy-Diamond highway.** • **Distrubances of Cree users by noise and dust and increased risk of accidents.**	**UTT 01, UTT 02, CIR 01, CIR 03, CIR 08 to 15, SON 01, VIE 01, VIE 05, VIE 15, NOR 11**	**Low**	**Regional**	**Long**	**Moderate**

Table 7-21 Assessment of residual impacts (cont.)

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Social environment (cont.)								
Infrastructure	Construction	• Transportation and traffic. • Economic development and presence of workers.	• Increased traffic on Billy-Diamond highway.	CIR 01 to CIR 03, **AIR 03** and NOR 13	Low	Regional	Short	Minor
	Operation	• Transportation and traffic. • Economic development and presence of workers.	• Increased traffic on Billy-Diamond highway.	AIR 03, VIB **02** to VIB 04, CIR 01 to CIR 04, **CIR 08 à CIR 10** and NOR 13	Low	Regional	Short	Minor
	Rehabilitation	• Transportation and traffic. • Economic development and presence of workers.	• Increased traffic on Billy-Diamond highway.	CIR 01 to CIR 04	Low	Regional	Short	Minor
Perception of physical environment	Construction	• Site preparation and infrastructure construction. • Water management. • Transportation and traffic.	• Risk of disturbances related to changes in air quality, artificial light at night and noise, and groundwater and surface water quality that may affect Cree users of the territory who practise activities in the mine sector or workers at the km 381 truck stop and its patrons.	PER 01, UTT 02, **CIR 01, CIR 02,** CIR 04, **CIR 05,** VIE 01, **VIE 15, VIE 22,** AIR 01 to AIR 05, SON 01, QUA 01 to QUA 05, QUA 07 to QUA 13, LUM 01 to LUM 03, VIB 01, NOR 2 to NOR 5, NOR 9, NOR 11, NOR 13 and NOR 14	Low	**Local**	Short	Minor
					Low	**Local**	**Long1**	**Moderate**
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Water management. • Transportation and traffic.	• Risk of disturbances related to changes in air quality, artificial light at night and noise, and groundwater and surface water quality that may affect Cree users of the territory who practise activities in the mine sector or workers at the km 381 truck stop and its patrons.	PER 01, UTT 02, **CIR 01, CIR 02,** CIR 04 **to CIR 06**, VIE 01, AIR 01 to AIR 05, SON 01, QUA 01 to QUA 05, QUA 07 to QUA 13, LUM 01 to LUM 03, VIB 01 to VIB 04, NOR 2 to NOR 9 and NOR 11 to NOR 14	Moderate	**Isolated**	**Short**	**Minor**
	Rehabilitation	• Infrastructure dismantling Water management. • Transportation and traffic. • Economic development and presence of workers.	• Risk of disturbances related to changes in air quality, artificial light at night and noise, and groundwater and surface water quality that may affect Cree users of the territory who practise activities in the mine sector or workers at the km 381 truck stop and its patrons.	PER 01, UTT 02, **CIR 01,** CIR 04, **CIR 05,** VIE 01, **VIE 15, VIE 22, SUR 03 and SUR 04,** AIR 01 to AIR 03, SON 01, QUA 01 to QUA 05, QUA 07 to QUA 13, LUM 01 to LUM 03, NOR 1 to NOR 9, NOR 11, NOR 12 and NOR 14	Low	**Local**	Short	Minor
Quality of life – Cree First Nations	Construction	• Site preparation and infrastructure construction. • Transportation and traffic. • Economic development and presence of workers.	• Feeling of loss and damage to the Cree cultural identity. • Decreased sense of safety among Billy-Diamond highway users. • Cree workers' difficulty integrating into the working environment.	UTT 01 to **UTT 05**, CIR 01**, CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16,** VIE 01 to VIE **22, ELR 05, ELR 06, ELR 13 and PER 01**	Low	Regional	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Transportation and traffic. • Economic development and presence of workers.	• Feeling of loss and damage to the Cree cultural identity. • Decreased sense of safety among Billy-Diamond highway users. • Cree workers' difficulty integrating into the working environment.	UTT 01 to **UTT 06,** CIR 01, **CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16,** VIE 01 to VIE **22, ELR 05 to** ELR 08, **ELR 13 and PER 01**	Moderate	Regional	Moderate	Moderate
	Rehabilitation	• Infrastructure dismantling pit rehabilitation. • Transportation and traffic. • Economic development and presence of workers.	• Feeling of loss and damage to the Cree cultural identity. • Decreased sense of safety among Billy-Diamond highway users. • Cree workers' difficulty integrating into the working environment.	**VIE 04, VIE 06 to VIE 10, VIE 12 to VIE 17, VIE 19 to VIE 22, ELR 05, 07, ELR 08 and PER 01**	Low	Regional	Short	Minor
Quality of life – women, youth and elders from the communities of Eastmain and Waskaganish	**Operation**	• **Presence and operation of the pit.** • **Other infrastructure in operation.** • **Management of ore, surface deposits and waste rock.** • **Transportation and traffic.** • **Economic development and presence of workers.**	• **Feeling of loss and offence to Cree cultural identity.** • **Decrease in the feeling of safety for users of the Billy-Diamond highway.** • **Difficulties in integrating Cree workers into the workplace.**	**UTT 01 to UTT 06, CIR 01, CIR 02, CIR 04, CIR 05, CIR 08 to CIR 16, VIE 01 to VIE 22, ELR 05 to ELR 08, ELR 13 and PER 01**	**Low**	**Regional**	**Moderate**	**Moderate**
Quality of life – community of Matagami	**Operation**	• **Transportation and traffic in Matagami, including the increase of activity in the transshipment yard.** • **Economic development and presence of workers**	• **Risks of disturbances due to traffic increase on the Billy-Diamond highway and on Road 109 in Matagami.**	**AIR 02, NOR 11, SON 01, CIR 01, CIR 08 à CIR 15, and VIE 01**	**Low**	**Local**	**Moderate**	**Minor**

Table 7-21 Assessment of residual impacts (cont.)

Environmental component	Project phase	Potential source(s) of impact	Description of impact	Mitigation measures and/or applicable standards	Significance of residual impact			Significance of residual impact
					Intensity	Extent	Duration	
Social environment (cont.)								
Local and regional economy	Construction	• Economic development and presence of workers.	• Increased local demand for goods and services. • Hiring of local workforce. • Development and enhancement of local and regional expertise.	ERL01 to ERL06, **ELR 09 to ELR 15, ELR 17, ELR 18 and VIE 07**	Positive impact			
	Operation	• Economic development and presence of workers.	• Local demand for goods and services. • Hiring of local workforce. • Development and enhancement of local and regional expertise.	ERL01 to ERL08	Positive impact			
	Rehabilitation	• Economic development and presence of workers	• Local demand for goods and services and for workforce. • Hiring of local workforce.	ERL01 and ELR03 to ERL06	Positive impact			
Heritage and archaeology	Construction	• Site preparation and infrastructure construction.	• Fortuitous discovery of remains of archaeological or historical interest.	ARC01, ARC 02 and NOR17 to NOR19	Low	Isolated	Long	Minor
	Operation	• Presence and operation of the pit. • Management of economic material, overburden and waste rock.	• Fortuitous discovery of remains of archaeological or historical interest.	ARC01, ARC 02 and NOR17 to NOR19	Low	Isolated	Long	Minor
	Rehabilitation	• No anticipated impact.						
Landscape	Construction	• Site preparation and infrastructure construction. • Transportation and traffic.	• Transformation of the character of the landscape and change to observers' visual field.	SUR 01 to SUR 04, AIR 01, AIR 03 and AIR 05	Low	Local	Short	Minor
	Operation	• Presence and operation of the pit. • Other infrastructure in operation. • Management of ore, surface deposits and waste rock. • Transportation and traffic.	• Transformation of the character of the landscape and change to observers' visual field.	SUR 01 to SUR 04, AIR 01, AIR 03 and AIR 05	Moderate to High[2]	Local	Long	Moderate to Major2
	Rehabilitation	• Infrastructure dismantling Pit rehabilitation. • Transportation and traffic.	• Potential impacts on landscape and visual field.	SUR 02, AIR 01, AIR 03 and PAY 01	Low	Local	Short	Minor

1 Cree users of the sector consider as irreversible the changes caused by construction activities to their negative perception of the quality of the environment and water. Thus, according to their assessment, the duration of the impact would be long.
2 When the infrastructures are visible in the foreground of the field of vision of the users of the Billy-Diamond road, the intensity and the importance of the impact would be considered from time to time strong