



Canadian Environmental  
Assessment Agency

Agence canadienne  
d'évaluation environnementale

# Arnaud Mining Project

## Comprehensive Study Report



July 2015

Cover photo credited to (Mine Arnaud Inc.).

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## Executive Summary

Mine Arnaud Inc. (the proponent) proposes to operate an apatite mine which would have an annual extraction rate of approximately 11 million tonnes of ore and a production of apatite concentrate of approximately 1.2 million tonnes a year. The project is located to the north of Arnaud Township of the Municipality of Sept-Îles in the North Shore administrative region. The deposit is located approximately 10 kilometers (via Route 138) to the west of downtown Sept-Îles and of the Innu community of Uashat mak Mani-Utenam. The project consists mainly of an open pit mine, an ore processing plant, and mine waste impoundment and storage areas. The project will also involve moving an approximately 8 km section of railway track at the mine site as well as the construction and use of storage, handling and loading facilities at the Port of Sept-Îles. The operating life of the mine is estimated at 31 years.

A federal environmental assessment is required under the *Canadian Environmental Assessment Act, 2010* (S.C. 1992, c. 37) (the former Act) because Fisheries and Oceans Canada, the Canadian Transportation Agency and the Governor in Council will likely have to make decisions in the context of the project. The Sept-Îles Port Authority will lease land located within the Port of Sept-Îles to the proponent for the construction of facilities for the handling, storage and transshipment of the apatite concentrate. The project is subject to a comprehensive study environmental assessment, in accordance with sections 10 and 16 of the *Comprehensive Study List Regulations* under the former Act.

The project was also subject to an environmental assessment by the province of Quebec under Chapter I of the *Quebec Environment Quality Act*.

The Canadian Environmental Assessment Agency (the Agency) conducted the comprehensive study in collaboration with the Federal Environmental Assessment Committee (the Federal Committee), composed of representatives of Fisheries and Oceans Canada, Natural Resources Canada, Environment Canada, the Canadian Transportation Agency, Health Canada and the Sept-Îles Port Authority.

In the comprehensive study report, the Agency presents the effects of the project on the following valued ecosystem components: human health, water resources, fish and fish habitat, terrestrial wildlife and wildlife habitat, birds and bird habitat, and the current use of lands and resources for traditional purposes.

The Agency assessed the significance of the effects of the project on the basis of information provided by the proponent in its environmental impact statement and supplementary documents, opinions provided by federal experts and those provided by the province, as well as comments received from the public and the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John.

Concerns were raised by the Innu and the public about the following aspects: human health, water quality (particularly of the Baie des Sept Îles and des Rapides Lake), air quality, noise and vibrations, the effects of the environment, including climate change, on the project, the risks of accidents and malfunctions, the use of the area for traditional purposes and cumulative impacts.

The proponent has undertaken to implement the mitigation measures deemed necessary by the Federal Committee, which should make it possible to reduce the project's potential effects on the environment.

These measures include a plan for managing dust emissions, restricting work during sensitive periods for wildlife, a mine wastewater management plan, and implementing compensation measures relating to fish, bird and terrestrial wildlife habitat. The proponent is also proposing to implement a follow-up program for several of the valued biophysical and human components, as well as an emergency response plan in the event of accidents or spills.

A follow-up program is required to verify the accuracy of the environmental assessment and to determine the effectiveness of some of the proposed mitigation measures. Fisheries and Oceans Canada and the Canadian Transportation Agency, as responsible authorities for the project, will be responsible for ensuring the development and implementation of the follow-up program.

Taking into account the implementation of the proposed mitigation measures and follow-up program, the Agency concludes that the project is not likely to cause significant adverse environmental effects.

The Minister of the Environment will consider this report and the comments received from the public and Aboriginal groups before preparing the environmental assessment decision statement. If the environmental assessment decision is favourable, Fisheries and Oceans Canada and the Canadian Transportation Agency may decide to issue authorizations under section 37 of the former Act. The Governor in Council may also decide to add water bodies to Schedule 2 of the *Metal Mining Effluent Regulations* as tailings impoundment areas. The Sept-Îles Port Authority may issue a lease for the lands necessary for the construction of the proponent's facilities at the Port of Sept-Îles.

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## List of Abbreviations and Acronyms

Abbreviation/Acronym	Definition
µg	microgram
dB(A)	A-weighted decibel
g	gram
ha	hectare
km	kilometre
km <sup>2</sup>	square kilometre
l	litre
m <sup>2</sup>	square metre
m <sup>3</sup>	cubic metre
mg	milligram
mm	millimetre
Mm <sup>3</sup>	million cubic metres
Mt	million tonnes
NO <sub>2</sub>	nitrogen dioxide
PM <sub>2.5</sub>	fine particulate matter less than 2.5 microns
SO <sub>2</sub>	sulphur dioxide
t CO <sub>2</sub> eq	tonnes of carbon dioxide equivalent
t/d	tonnes/day
the Act	<i>Canadian Environmental Assessment Act, 2012</i>
the Agency	Canadian Environmental Assessment Agency
the Federal Committee	Federal Environmental Assessment Committee
the former Act	<i>Canadian Environmental Assessment Act, 2010</i>
the proponent	Mine Arnaud Inc.
the province	Quebec Department of Sustainable Development, the Environment and the Fight Against Climate Change
TSP	total suspended particulates

# 1 Introduction

## 1.1 Project overview

Mine Arnaud Inc. (the proponent), a joint venture between Investissement Québec and Yara International ASA, intends to operate an apatite<sup>1</sup> mine with an annual production capacity of approximately 11 Mt of ore and approximately 1.2 Mt of apatite concentrate. The project is located north of Arnaud Township of the Municipality of Sept-Îles and affects the unincorporated territory of Lac-Walker and the Matimek controlled harvesting zone in the administrative region of Côte-Nord. The deposit is located approximately 10 km (along Route 138) west of downtown Sept-Îles and the Innu community of Uashat mak Mani-utenam (Figure 1).

The project includes an open-pit mine, an ore processing plant, and overburden, waste rock and tailings containment and storage areas, including a cell for waste titaniferous magnetite<sup>2</sup>, a by-product of the ore processing. The project will also involve moving an approximately 8-km section of railway track at the mine site and building and using storage, handling and loading facilities at the Port of Sept-Îles. The estimated operating life of the mine is 31 years.

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<sup>1</sup> Apatite refers to a group of phosphate minerals of variable composition. Apatite is more than 41% phosphorus oxide (P<sub>2</sub>O<sub>5</sub>), making it a major source of phosphate ([Quebec Department of Energy and Natural Resources](#)). Website accessed in October 2014.

<sup>2</sup> Titaniferous magnetite (iron and titanium oxides), which needs to be separated from the ore to obtain the phosphate concentrate, would be stored separately for potential utilization.

Figure 1 Project location



Source: Mine Arnaud 2015

## 1.2 Environmental Assessment Process

This project is subject to the *Canadian Environmental Assessment Act, 2010* (S.C. 1992, c. 37) (the former Act) which was repealed and replaced on July 6, 2012, by the *Canadian Environmental Assessment Act, 2012*. The assessment of the Arnaud mine project is being carried out by the Canadian Environmental Assessment Agency (the Agency) under the former Act that applies to federal authorities contemplating certain actions or decisions required to enable a project to proceed in whole or in part.

A federal environmental assessment is necessary because permits and authorizations designated under the *Law List Regulations* could be issued, including by the Canadian Transportation Agency under the *Canada Transportation Act* and by Fisheries and Oceans Canada under the *Fisheries Act*. Consequently, those two entities are responsible authorities for the environmental assessment. In addition, the Governor in Council could decide to list water bodies as tailings impoundment areas in Schedule 2 to the *Metal Mining Effluent Regulations* (MMER).

A comprehensive study is required for this project under sections 10 and 16 of the *Comprehensive Study List Regulations*, pursuant to the former Act. Those sections read as follows:

- s. 10. The proposed construction, decommissioning or abandonment of a facility for the extraction of 200 000 m<sup>3</sup>/year or more of ground water or an expansion of such a facility that would result in an increase in production capacity of more than 35 per cent;
- s. 16. (a) The proposed construction, decommissioning or abandonment of a *metal mine, other than a gold mine, with an ore production capacity of 3 000 t/day or more.*

The Sept-Îles Port Authority will lease land located in the Port of Sept-Îles area, more specifically in the Pointe-Noire sector, to the proponent for the construction of apatite concentrate handling, storage and transfer facilities. Under section 3 of the *Canada Port Authority Environmental Assessment Regulations*, the Sept-Îles Port Authority must ensure that an environmental assessment of the project is conducted before the disposal of an interest in land per paragraph 5(1)(c) of the former Act.

The project was also subject to an environmental assessment by the province under Chapter I of Quebec's *Environment Quality Act*. It was referred to the Bureau d'audiences publiques sur l'environnement. The province has approved the project in February, 2015. As part of the *Canada–Quebec Agreement on Environmental Assessment Cooperation*, the Agency worked with Quebec throughout the assessment of the project to improve the effectiveness of the implementation of the environmental assessment processes.

## 1.3 Objective of the comprehensive study report

The purpose of this comprehensive study report is to provide a summary of the analysis conducted by the Agency to determine whether the project is likely to cause significant adverse environmental effects. The Agency's conclusions are based on the proponent's environmental impact statement and related documents, including a number of complementary documents and sector studies, as well as an assessment of the environmental effects of the project, and a review of the comments of the public and Aboriginal groups on the project. The Agency prepared this comprehensive study report in collaboration with the Federal Environmental Assessment Committee (the Federal Committee), composed of

representatives of Fisheries and Oceans Canada, Environment Canada, Natural Resources Canada, Health Canada, the Sept-Îles Port Authority, the Canadian Transportation Agency and of the Agency. The Agency also consulted the documents submitted to the Bureau d'audiences publiques sur l'environnement and to the Quebec Department of Sustainable Development, Environment and the Fight Against Climate Change (the province) as part of the provincial environmental assessment.

The Minister of the Environment will consider this report and the comments received from the public and Aboriginal groups before preparing the environmental assessment decision statement. Before issuing the environmental assessment decision, the Minister may request supplemental information or request that additional measures be taken. Following the announcement of the environmental assessment decision, Fisheries and Oceans Canada and the Canadian Transportation Agency may make their respective decisions on the issuance of their permits or authorizations under section 37 of the former Act. The Governor in Council may also decide to add water bodies to Schedule 2 of the MMER. According to the *Canada Port Authority Environmental Assessment Regulations*, the Sept-Îles Port Authority will consider this comprehensive study report and the comments received from the public and Aboriginal groups before making its decision to grant a lease for the lands necessary for the construction of the proponent's facilities at the Port of Sept-Îles.

## 2 Project Scope

The scope of the project for the purpose of the federal environmental assessment includes the physical works and activities associated with the construction, operation, and decommissioning of the mine, railway line and port facilities, as described in the sections below.

### 2.1 Project Components

The general layout of the main facilities planned for the project site is shown in Figure 2. The mining facilities include:

- an open-pit mine approximately 800 m wide by 3.7 km long by 250 m deep;
- a crusher and concentrator with an annual production capacity of 1.2 Mt of concentrate;
- a low-grade ore stockpile, a temporary ore storage area, and a crushed ore storage dome;
- a waste rock pile with a capacity of 33 Mm<sup>3</sup> and an overburden storage area with a total volume of 1 Mm<sup>3</sup>;
- a tailings pond made up of six cells, facilitating the segregation of two types of tailings (flotation tailings and titaniferous magnetite tailings), with a total capacity of 320 Mt;
- a screening mound measuring 4 km long by 300 m wide by 40 m high;<sup>3</sup>
- a sedimentation pond with a capacity of 25 Mm<sup>3</sup> and a dam;
- an emergency diversion dike<sup>4</sup>;
- a system of drainage water collection trenches;
- an industrial wastewater treatment plant; and
- rail loading facilities, including a conveyor belt and two silos with a total capacity of 9,000 t.

The related facilities are:

- a 4.2-km access road to the site from Route 138;
- service roads at the mine site;
- a new 8-km section of railway track;
- an electrical substation to supply electricity to the processing plant and the mine;
- a petroleum product storage site;
- service buildings (administration, garage, etc.);
- a new section of snowmobile trail No. 3;
- two storage facilities (one for explosive primers and one for detonators);

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<sup>3</sup> The anticipated volume of the screening mound is 15.8 Mm<sup>3</sup>.

<sup>4</sup> This is a dike that would be used to divert water and tailings toward the pit in the event of a breach in the tailings pond dam or sedimentation pond dam.

- facilities at the Port of Sept-Îles, including four concentrate storage silos (total capacity of 60,000 t), two conveyor belts, and a shiploader (Figure 3).

## **2.2 Activities**

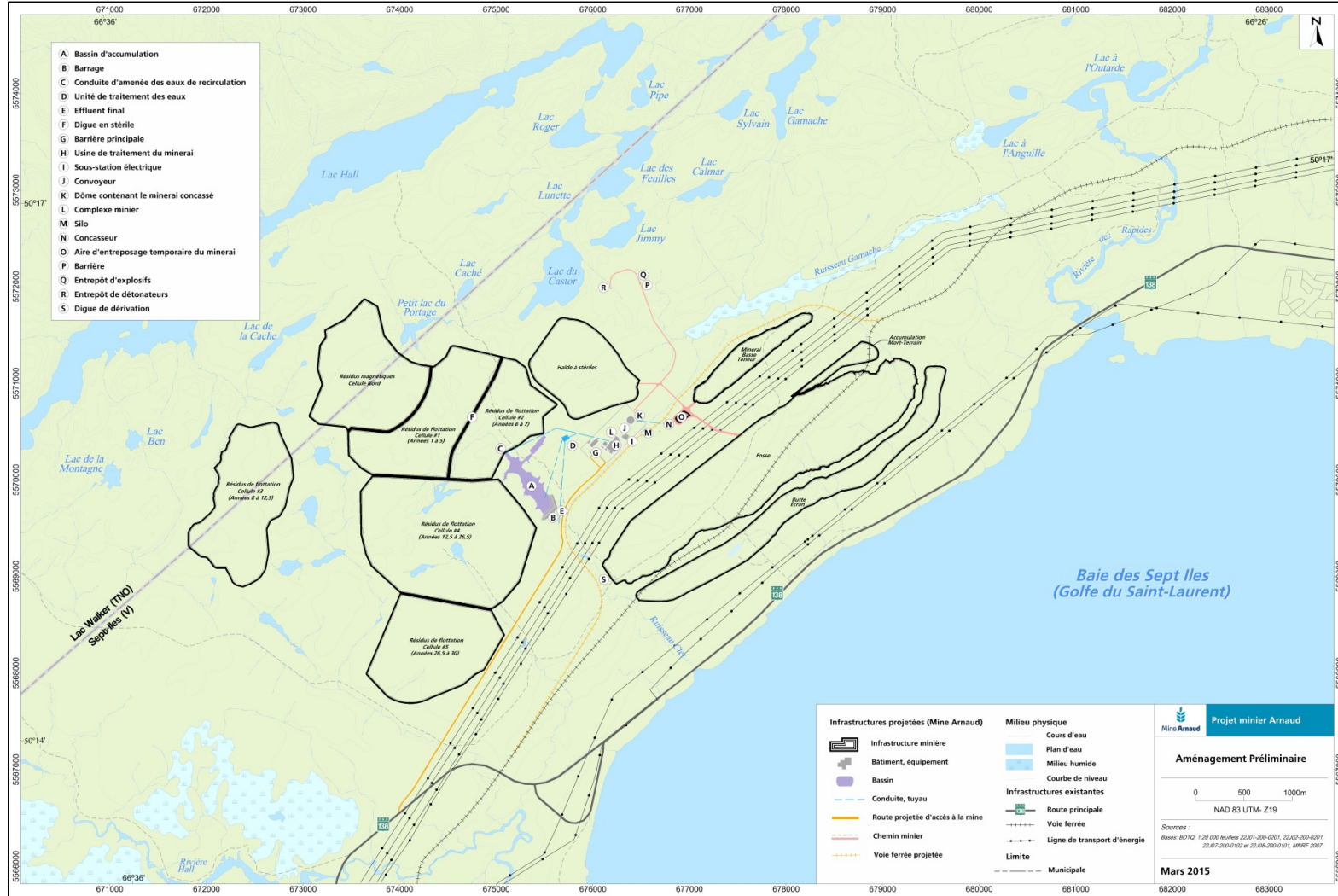
The activities required to carry out the project are described in Table 1 for each of the project's three lifecycle phases: preliminary work and construction, operation, and decommissioning and reclamation.

## **2.3 Schedule**

The proponent expects the construction phase to take two years starting in the spring of 2016. Ore production is scheduled to begin in 2018 and continue for 31 years. Overburden excavation will be spread out over a period of 12 years, and the overburden will be used for such purposes as building the screening mound, which is scheduled to be built in the first 5 years. Site reclamation will occur gradually and will begin at the start of the operating phase. The closure and reclamation work will be spread out over two years starting in 2049.



**Figure 2** Layout of the Arnaud Mining Project Facilities



Source: Mine Arnaud 2015

Figure 3 Layout of the port infrastructure



Source: Mine Arnaud 2015

**Table 1 Project Activities**

Preliminary work and construction phases	Operating phase	Decommissioning and reclamation phase
2 years	31 years	2 years
<ul style="list-style-type: none"> <li>• Tree clearing, grubbing, grading, stripping, blasting, filling and fill removal to prepare surfaces for facilities and develop the storage areas (overburden, ore, waste rock, tailings, screening mound) and the access and mining roads;</li> <li>• Blasting, overburden and waste rock removal to prepare the pit;</li> <li>• Construction of the access and mining roads;</li> <li>• Dismantling and construction of an 8-km section of railway track;</li> <li>• Installation of the pumping system and dewatering of lakes and streams;</li> <li>• Development of the on-site water management system (construction of dikes, trenches, culverts, dams, sedimentation pond, treatment facilities, pumping facilities, etc.);</li> <li>• Construction of mine facilities (crushing facilities and ore processing plant, concentrate storage silos, service buildings, industrial wastewater treatment, etc.);</li> <li>• Construction of concentrate storage silos, conveyor belts and a shiploader at the Port of Sept-Îles;</li> <li>• Storage and management of hazardous substances, fuels and waste;</li> <li>• Construction of explosives storage facilities and explosives handling.</li> </ul>	<ul style="list-style-type: none"> <li>• Drilling, blasting and extraction of ore;</li> <li>• Handling, transportation and storage of waste rock, overburden and ore;</li> <li>• Crushing, grinding, magnetic separation, flotation concentration;</li> <li>• Thickening, filtration and drying of concentrate;</li> <li>• Storage, handling and transportation of concentrate (silos, train and transfer, and loading at the dock);</li> <li>• Pit dewatering through pumping of mine water;</li> <li>• Placement of magnetic and flotation tailings in the cells of the tailings pond;</li> <li>• Water management: runoff water, mine water, drinking water, process water, wastewater, etc.;</li> <li>• Treatment and disposal of excess water accumulated in the sedimentation pond;</li> <li>• Storage and handling of explosives;</li> <li>• Use and maintenance of machinery;</li> <li>• Storage and management of hazardous substances, fuels and waste;</li> <li>• Gradual restoration of the mine site (waste rock piles and tailings pond)</li> <li>• Operation and maintenance of the rail line;</li> <li>• Operation and maintenance of the concentrate storage silos, conveyor belt and shiploader at the Port of Sept-Îles.</li> </ul>	<ul style="list-style-type: none"> <li>• Water management: flooding of the pit, control and monitoring of surface water;</li> <li>• Decommissioning of mine facilities and rehabilitation;</li> <li>• Decommissioning of concentrate storage silos, conveyor belt and shiploader at the Port of Sept-Îles;</li> <li>• Rehabilitation and final revegetation of the site (waste rock piles, tailings pond, pit shores);</li> <li>• Management of hazardous substances and waste;</li> <li>• Rehabilitation of contaminated sites, if applicable.</li> </ul>

## 3 Scope of the Environmental Assessment

The scope of the environmental assessment establishes the framework and limits of the analysis conducted by the Agency.

### 3.1 Factors assessed

Pursuant to subsections 16(1) and 16(2) of the former Act, the Agency has taken the following factors into consideration:

- the purpose of the project;
- technically and economically feasible alternative means of carrying out the project, and the environmental effects of any such alternative means;
- the environmental effects of the project, including the environmental effects of malfunctions or accidents, and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the capacity of renewable resources that are likely to be significantly affected by the project to meet present and future needs;
- the significance of the effects;
- comments received from the public in accordance with the former Act and the regulations;
- technically and economically feasible measures that would mitigate any significant adverse environmental effects of the project;
- the need for and requirements of any follow-up program in respect of the project.

As permitted under paragraph 16(1)(e)<sup>5</sup> of the former Act, the Agency also asked the proponent to describe the need for and alternatives to the project.

Environmental effects are defined as: any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat, or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*; any effect of any change on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes by Aboriginal persons, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; or any change to the project that may be caused by the environment.

This definition includes indirect economic and social changes that are caused by biophysical modifications of the environment. It does not include the direct economic and social effects of the project. For example, the Agency

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<sup>5</sup> 16(1)(e): “any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel, such as the need for the project and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority, may require to be considered.”

may examine the economic effects of a decline in commercial fishery yields related to fish habitat loss, but it will not examine the economic effects related to the construction of the mine.

## 3.2 Spatial and Temporal Boundaries

As stated in the scope of the assessment and comprehensive study guidelines, the Agency requested that the proponent extend its analysis to the environmental sectors and factors with which the project could potentially interact. To meet this requirement, the proponent defined three study areas.

- a regional study area of 800 km<sup>2</sup> between the Sainte-Marguerite River and the Sept-Îles Airport along the east-west axis and between Hingan Lake and la Petite Basque Island along the north-south axis. This regional area was established to better situate the project in its socioeconomic context. The area was used to develop a profile of the communities located near the project in order to assess the large-scale impact of the project on certain components of the human environment. The regional area was also used to assess the effects of the environment on the project;
- a local study area of 202 km<sup>2</sup> that includes all project infrastructures, as well as the terrestrial and aquatic environments that could be directly or indirectly affected by the project. This area was used to analyze the potential effects of the project on elements of the biophysical and human environments (Figure 4)<sup>6</sup>;
- a small area of 100 km<sup>2</sup> was identified to assess the impact of air emissions on the biophysical and human environments.<sup>7</sup>

For the temporal boundaries, the proponent selected the entire duration of the project, i.e. 35 years, including the construction, infrastructure installation and operating phases, as well as the mine site closure and restoration phases.

## 3.3 Identification of Valued Components

The assessment of the potential environmental effects conducted by the proponent focused on 24 aspects of the natural and human environment that have specific value or importance from a legal, social or scientific viewpoint, and on which the project is likely to have effects.

The Agency grouped the factors of the environment around six valued components that were examined in the environmental assessment. These valued components are presented in Table 2, along with the rationale for their selection. The table also identifies the study areas in which the assessment of impacts was carried out.

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<sup>6</sup> During the environmental assessment, the proponent modified the local study area by removing the Baie des Sept-Îles. The proponent estimated that the project was not likely to cause effects to it (Bureau d'audiences publiques sur l'environnement, 2013, p.58). This aspect is discussed in section 7.4.3 of this report.

<sup>7</sup> This area corresponds to the modelling area defined according to the methodology of the Province Atmospheric Dispersion Modelling Guide (2005) [Quebec Department of Sustainable Development, the Environment and the Fight Against Climate Change](#). Website accessed in October 2014.





**Table 2 Valued Components, rationale and spatial boundaries**

Valued Component	Rationale	Spatial Boundaries
Water resources: groundwater and surface water quality and the water regime	The pumping of mine water out of the pit, the destruction of small streams and lakes for the construction of the mine facilities, and runoff from the facilities represent major changes that could affect water quality and the water regime. Water quality is governed by a provincial directive and federal regulatory requirements.	Local study area in the watersheds of the Hall and des Rapides Rivers and the small streams that drain into Sept Îles Bay.
Human health: impact of changes to the environment (air quality, noise environment and drinkable water) on quality of life and human health	The project is located in Arnaud Township in the Municipality of Sept-Îles and is 4 and 6 km (by air) away from the Ferland neighbourhood and the point of Uashat respectively. The potential environmental effects of the project could have an impact on quality of life and human health. The dust, air emissions, noise and discharge water generated by the project during the construction and operating phases could affect residents and users of the area.  GHG emissions contribute to climate change, which has an impact on the environment and human health. Emissions of NO <sub>2</sub> and SO <sub>2</sub> also contribute to acid rain, which also has an environmental impact.	Local study area. Within the local area, atmospheric dispersion modelling was carried out over a 10-km by 10-km zone around the proposed mine development area, as recommended by the methodology of the province.  GHG, NO <sub>2</sub> and SO <sub>2</sub> emissions are being studied within a broader context, since the environmental effects of these gases are a provincial, national and global concern.
Fish and fish habitat: the aquatic environment including aquatic and riparian vegetation and fish species.	Fish and fish habitat contribute to local fishing activities (including traditional fisheries) and support ecological diversity. They are protected by the <i>Fisheries Act</i> . The streams that could be affected by mining project activities contain spawning grounds for brook trout and rainbow smelt. An eelgrass bed, located in the Sept Îles Bay, could be affected	Local study area in the watersheds of the Hall and des Rapides Rivers and small streams that drain into Sept Îles Bay.
Birds and their habitat: waterfowl, waterbirds, forest birds, and raptors, as well as critical aspects of their habitat, including terrestrial vegetation, wetlands and water bodies.	Birds are regulated under the <i>Migratory Birds Convention Act, 1994</i> .  Some bird species are protected under the <i>Species at Risk Act</i> .  Some bird species are hunted by members of Uashat mak Mani-Utenam who use the area.	Local study area, more specifically within the proposed mine development area, along the rail line and at the port site.  The analysis of habitat availability takes into account the regional study area.
Terrestrial wildlife and its habitat (reptiles and amphibians, fur-bearing mammals, small mammals and large mammals)	Several species, including moose, are hunted by members of Uashat mak Mani-Utenam who use the area.	Local study area, more specifically within the proposed mine development area, along the rail line and at the port site. The analysis of habitat availability takes into account the regional study area.

Valued Component	Rationale	Spatial Boundaries
Current use of land and resources for traditional purposes and site or thing of archaeological, heritage or historical significance.	The project could have an impact on traditional users of the territory and on the resources they harvest.	Local study area, more specifically within the proposed mine development area, along the rail line and at the port site. The analysis of habitat availability takes into account the regional study area.

### 3.4 Need for and Purpose of the Project

According to the proponent, 90% of world phosphate production is used to make fertilizer for crops intended for human and animal consumption. According to the Food and Agriculture Organization of the United Nations,<sup>8</sup> world demand for cereal products is growing. In addition to this increased demand, a number of phosphate rock mines around the world have closed, and the cost of constructing new mines has risen. The proponent has indicated that the price of phosphate rock has doubled in the last 15 years.<sup>9</sup> Furthermore, the price of apatite (igneous phosphate rock), the type found in Sept-Îles, would be even higher because of its purity. The apatite in the Arnaud deposit would contain few contaminants, unlike the sedimentary phosphate rock that is more commonly found around the world. According to the proponent, these factors weigh in favour of mining the Arnaud apatite deposit.

The groups and individuals that participated in the public consultation activities as part of the environmental assessment of the project raised concerns about the potential overall benefits of the mine near the Municipality of Sept-Îles as weighed against the impact it will have on local residents. The proponent maintains that the project will be beneficial for the region.

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<sup>8</sup> [Food and Agriculture Organization of the United Nations](#). Website accessed in September 2014.

<sup>9</sup> [Infomine](#). Website accessed in September 2014.



## 4 Alternatives to the Project and Analysis of Alternative Means

The following sections outline the alternatives to the project, the alternative means analyzed, and the options selected by the proponent.

### 4.1 Alternatives to the Project

Alternatives to the project are functionally different ways to meet the need for and purpose of the project. Alternatives to the project are limited because the desired resource is found only in the mine deposit located at the proposed project site. However, the proponent has assessed the impact of the “status quo,” i.e. a situation where the project is not carried out. In its opinion, the status quo would result in a loss of investment of up to \$750M and an annual loss of salaries and benefits amounting to \$30M (330 direct jobs during the operation of the mine) for the region. Since other alternatives to the project are not possible, the proponent analyzed alternatives to certain project components.

### 4.2 Analysis of Alternative Means

Under paragraph 16(2)(b) of the former Act, the proponent must examine alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means. The proponent has examined a number of alternatives to the following project components:

- ore concentration;
- mine waste storage methods and tailings deposition modes;
- location of mine waste disposal sites;
- access road;
- transportation of concentrate;
- industrial and drinking water supply.

For each component, the proponent identified the best options from a technical, environmental, social and economic standpoint. A table providing information on the alternatives to the project components and their advantages and disadvantages is shown in Appendix A.

#### *Ore concentration*

Flotation is the only process used in the world to concentrate apatite ore. Several combinations of reagents (including rice, palm or soybean oils) were tested, and a combination of wheat starch, soybean oil and caustic soda was selected. The advantage of these reagents is that, unlike other chemical reagents, they are biodegradable.

The proponent considered alternatives in terms of the flotation equipment. The flotation circuit can be designed with either mechanical cells or flotation columns. For the ore mined by Mine Arnaud, the use of flotation columns would result in better apatite concentration, since separation is more efficient and impurities would be less abundant in the concentrate. This method was selected because it has technical and economic advantages over the mechanical cells and a comparable environmental impact.

### *Mine waste storage methods*

The proponent examined four methods of storing mine waste (tailings, waste rock, low-grade ore, overburden): underwater, on the surface, underground, and in the pit. The underwater and underground storage methods were excluded from the analysis because they provide no benefits. Underwater storage is suitable for preventing acid mine drainage, but that would not be an issue at the Arnaud mine site. Underground storage is not feasible because no underground facilities are planned. The proponent selected surface storage of tailings, overburden and low-grade ore. Waste rock could be stored on the surface and in the western portion of the pit during the final years of operation. Note that a large volume of overburden and waste rock is expected to be needed for the construction of the screening mound, which is why surface storage is justified.

The proponent also analyzed the potential for using four types of tailings deposition: slurry tailings, thickened tailings, paste tailings and filtered tailings. The paste and filtered tailings deposition methods were rejected for technical reasons. Slurry tailings deposition would involve accumulating and managing a large quantity of water in the tailings pond during the operation phase. The proponent therefore selected thickened tailings as a suitable tailings deposition method, owing to the high daily production rate and the particle size of the tailings.

### *Location of mine waste disposal sites*

To determine the optimal mine waste disposal site, the proponent conducted an assessment of alternatives using the method proposed by Environment Canada (Environment Canada, 2013). This assessment was required because the proponent had indicated its intention to dispose of deleterious substances (such as tailings, waste rock, low grade ore, and overburden) or to deposit effluent containing a deleterious substance in natural waters frequented by fish. Such a process requires a regulatory amendment to the *Metal Mining Effluent Regulations*.

The proponent conducted a multi-step assessment of the mine waste disposal alternatives based on multi-criteria decision analysis. The first step was to identify potential storage areas for tailings as well as for the construction of a screening mound and a sedimentation pond. With respect to tailings, the proponent identified two potential sites after eliminating those with major technical constraints and those encroaching on significant wetlands (see Figure 5). For each potential site, the proponent carried out an environmental, technical and socioeconomic characterization. Lastly, the proponent assessed each potential site against environmental, technical, economic and socioeconomic criteria.

The process led the proponent to conclude that site A (tailings pond) is the most advantageous when considering all of the environmental, technical and socio-economic issues (Figure 5). This site enables to limit the footprint around the pit and mine infrastructures, and to minimize the environmental impact. According to the proponent's analysis, this site has the least impact on the majority of the components of the human, physical and biological environments. It also involves fewer environmental risks in the event of malfunctions, particularly associated with the transportation of tailings.

Although this site minimizes the footprint around the pit and mine infrastructure, it requires encroachment of the proposed infrastructure on natural waters frequented by fish. Mine waste cannot be disposed of in a natural water body frequented by fish, unless that water body is listed in Schedule 2 of the *Metal Mining Effluent Regulations*. The determination of the final alternative will have to be validated by Environment Canada, and subsequently Governor in Council may take the decision to add the water bodies to schedule 2 of the *Metal Mining Effluent Regulations*.

### *Access road*

The access roads currently serving the mine site are located on the proposed site of the pit. The proponent prepared two options for developing new access roads: one to the west, via Route 138, 1 km east of the Hall River Bridge; and one to the east, via Vigneault Boulevard (Figure 6). The proponent selected the west alternative because it would limit encroachment on wetlands and avoid the need to build a bridge over the des Rapides River, which would have entailed additional costs and a greater impact on fish and fish habitat.

### *Transportation of concentrate*

The proponent examined four alternatives for the transportation of the concentrate: rail, road, conveyor belt and pipeline. The proponent selected rail transportation, which has an advantage over truck transportation in terms of greenhouse gas emissions and safety in transit. Along with the pipeline, it is also the least costly option. Lastly, rail transportation enables the proponent to use existing infrastructure without significantly increasing the impact on other users and residents of the surrounding area.

### *Industrial water supply*

Finding a supply of industrial water to meet the needs of the project was an issue for the proponent. The operation of the concentrator would require approximately 17,500 m<sup>3</sup> of water per day. A large part of those needs would be met by recirculating reclaimed water from the tailings pond. An additional supply of water would be necessary at all times, particularly for preparing reagents and compensating for water lost at the pump seals.

The proponent considered six different sources of industrial water from a technical and economic standpoint. Following this analysis, it selected two alternatives (surface water and recirculated mine water)<sup>10</sup> and compared their characteristics and the potential environmental impact of their use.

The alternative selected by the proponent was the use of recirculated mine water. Although it is more costly than the surface water alternative because it requires the construction of a water filtration plant, the recirculated mine water option is better for reducing environmental impacts and usage conflicts. It would allow for optimal use of water resulting from mine activities without putting pressure on local resources. Furthermore, it would reduce the volume of final effluent to be discharged to Clet Creek.

### *Drinking water supply*

Domestic consumption of drinking water is estimated at 40 m<sup>3</sup>/day. The proponent considered four alternatives to the drinking water supply: groundwater (drilling a well), surface water, treating the supernatant effluent from the polishing pond, and the City of Sept-Îles water system. The last option, which will involve the construction of a 3-km water line, was selected because it will provide a reliable, high-quality source of water over the years.

### *Activities and works without alternatives*

For technical or logistical reasons, possible alternatives were not analyzed for certain works and activities, including the following:

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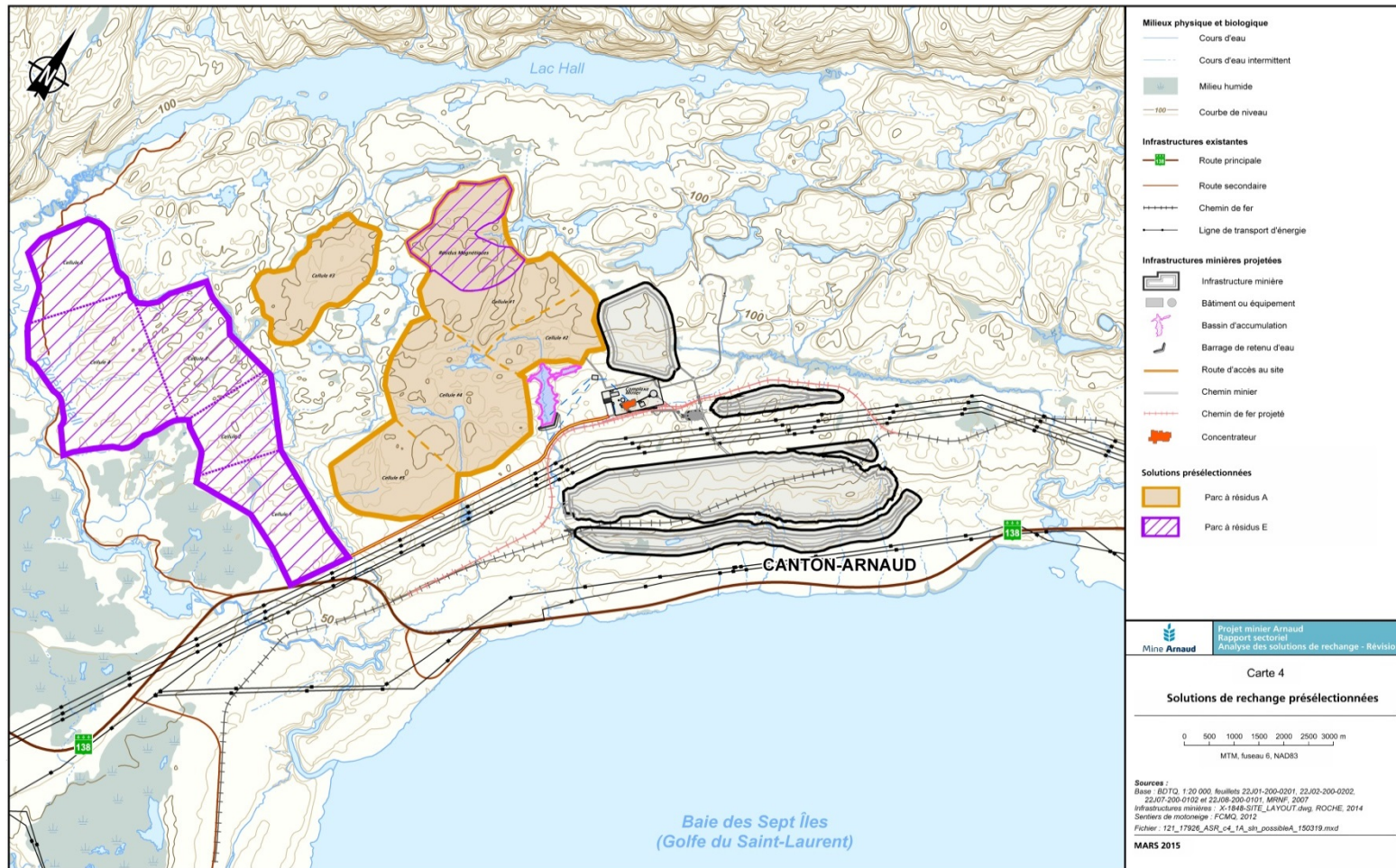
<sup>10</sup> In addition to the reclaimed water from the tailings pond, recirculated mine water includes mine water pumped out of the pit, runoff water from stockpiles, and drainage water recovered around the mine facilities.

- deposit mining method: Open-pit mining is the only possible option because the mineralized zone is near the surface. The characteristics of the deposit preclude any alternatives for extracting the ore or for positioning the pit;
- location of mine facilities other than the tailings pond and waste rock piles: This infrastructure would be located near the deposit. The proponent considered the topography, drainage networks, sensitive ecosystems and risk management when developing the site layout. Note that the proponent took into account residents living near Route 138 and decided to position the mine infrastructure north of the power lines (Figure 2);
- industrial wastewater management: All wastewater resulting from mining processes would pass through the sedimentation pond before being treated at the treatment plant and discharged through the sole discharge point to Clet Creek. This water management approach would avoid affecting water quality in the watersheds of Hall Lake and the des Rapides River. The location of the sedimentation pond was selected to maximize the use of the site topography. Given the high volumes of mine and runoff water to be managed at the site, it was necessary to find a large site where a polishing pond could be constructed;
- industrial wastewater treatment: The industrial wastewater treatment plant would be built on high ground near the sedimentation pond and would provide high-quality water for the process and for the final effluent. The wastewater would be treated in two stages, namely a physico-chemical treatment followed by nanofiltration membrane treatment;
- domestic wastewater treatment: Only one option was proposed, namely a septic tank and tile field. A detailed description of the system will be developed during the detailed engineering phase.

### **4.3 Conclusion of the Agency**

The Agency is satisfied with analysis of alternatives to and alternative means conducted by the proponent for the purposes of the environmental assessment. The options selected following the alternative means analysis are realistic solutions that have the least environmental impacts.

Figure 5 Location of potential mine waste storage sites



Source: Mine Arnaud 2015





## 5 Consultation

Public and Aboriginal consultations strengthen the quality and credibility of environmental assessments. The comments and concerns received through consultations help to clarify the potential effects of a project, beginning at the planning stage. As part of the Arnaud Mining Project, the Agency, together with the Federal Committee, conducted a number of public and Aboriginal consultation activities.

The Agency also administers a Participant Funding Program to support individuals, non-profit organizations, environmental groups and Aboriginal groups interested in participating in federal environmental assessments. As part of this comprehensive study, the Agency allocated a total of \$63,200 to the Uashat mak Mani-Utenam First Nation and to seven organizations and citizens' groups to reimburse eligible expenses associated with participating in this study.

### 5.1 Public Consultation Activities held by the Federal Government

The federal environmental assessment process provides for three official opportunities for public participation. The Agency posted notices on the Canadian Environmental Assessment Registry Internet site and in various local newspapers and radio stations to announce the consultation periods and the Participant Funding Program. Documents relevant to the consultations were posted on the Canadian Environmental Assessment Registry Internet site and made available at various public places in communities near the project. In addition, all of the documents related to the environmental impact statement are available on the proponent's website.

The first consultation, which gave participants an opportunity to comment on the project and the comprehensive study process, was held from January 24 to February 24, 2012. During this consultation, the Agency received comments opposing the project from three citizens.

The second consultation period, which was held from May 8 to June 7, 2013, solicited stakeholder comments on the potential environmental effects of the project and the mitigation measures proposed by the proponent in its environmental impact statement. During this consultation, the Agency received submissions from eight organizations and citizens' groups, which raised many concerns about various issues, particularly air and water quality, noise and vibration nuisance, and effects on Sept-Îles Bay.

For the third consultation period, the Agency invites the public to submit observations on the content, conclusions and recommendations of this comprehensive study report. The Agency will submit the comments it receives to the Minister of the Environment to inform the Minister's environmental assessment decision for this project.

### 5.2 Aboriginal Consultation Activities held by the Federal Government as part of the Comprehensive Study

#### 5.2.1 *Analysis of the need to consult with Aboriginal groups*

The federal government regularly consults with Aboriginal groups for reasons of good governance in order to contribute to its objectives of sound management and informed decision making. Moreover, the federal government has a duty to consult with Aboriginal groups and, if appropriate, to provide for accommodation

measures when it contemplates conduct that may have adverse impacts on established or potential Aboriginal and treaty rights. Federal environmental assessments consider any effect of any project-related change in the environment, as well as the effects of that change on current uses of land and resources for traditional purposes by Aboriginal persons. The process also requires consideration of any effect of any project-related change in the environment on “any structure, site, or thing that is of historical or archaeological significance,” such as sites historically occupied by Aboriginal peoples.

In order to meet the government’s duty to consult Aboriginal persons and to facilitate a whole-of-government approach, the Agency, as Consultation Coordinator for the environmental assessment of the project, held consultations with the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John. The Uashat mak Mani-Utenam First Nation claims Aboriginal title, Aboriginal rights and treaty rights to a territory that includes the entire area affected by the project. This comprehensive land claim has been accepted for negotiation by the Government of Canada. The project is located very close to the community (10 km via Route 138), and the Uashat mak Mani-Utenam First Nation states that it strongly values the territory that could be adversely affected by the project including Sept-Îles Bay. According to the Innu First Nation of Uashat mak Mani-Utenam, the project would also have significant impacts on claimed Aboriginal rights, including title and treaty rights. Furthermore, the Uashat mak Mani-Utenam First Nation has informed the Agency that the project could destroy cultural sites and would have an impact on community members’ hunting, fishing, trapping and harvesting activities, use of drinking water and health and well-being. The Uashat mak Mani-Utenam First Nation received \$23,200 under the Participant Funding Program.

Although the community of Matimekush-Lac John is located approximately 500 km north of the project, it shares the land claim of the Uashat mak Mani-Utenam Nation. The two communities have common ancestors and still have family ties today. The Uashat mak Mani-Utenam and Matimekush-Lac John First Nations filed a submission citing the risks and the negative impacts described above. The Matimekush-Lac John Nation did not apply for funding under the Participant Funding Program.

### 5.2.2 Consultation Activities

The Federal Committee and the two Aboriginal communities agreed on a consultation plan that provided for participation activities at various stages of the environmental assessment. By the end of the comprehensive study process, the two Innu First Nations will have received three formal consultation opportunities. Furthermore, throughout the environmental assessment process, the Agency has maintained regular contact with the Aboriginal groups. At their request, the Agency also invited representatives of the Uashat mak Mani-Utenam community to participate in certain work sessions of the Federal Committee. To announce the three consultation opportunities, the Agency notified the relevant band councils in correspondence and placed notices in the *Innuvelle* newspaper.

During the first consultation period, which provided an opportunity to comment on the draft guidelines for the proponent, the Agency received a submission from the Uashat mak Mani-Utenam First Nation. The community’s comments led to the addition of details to the guidelines with regard to the proponent’s requirements to consult with Aboriginal groups and consider traditional knowledge.



During the second consultation period, the First Nations were invited to submit comments on the environmental effects of the project, the impacts on their land claims or treaty rights, and the accuracy of the information provided by the proponent in the environmental impact statement. On June 5, 2013, the federal government and the Uashat mak Mani-Utenam Band Council held a consultation meeting at which the elected leaders and the employees of Uashat mak Mani-Utenam were able to express their concerns about the project directly to the Agency representatives.

On September 19, 2013, the Innu First Nations of Uashat mak Mani-Utenam and Matimekush Lac-John filed a joint submission to the Bureau d'audiences publiques sur l'environnement, as part of the provincial environmental assessment of the project. The Uashat mak Mani-Utenam informed the Agency that the submission should also be considered their official comments for the federal environmental assessment. In their submission, the two communities provide a brief description of their use of the area and resources targeted by the project and the anticipated impacts on that use.

For the third consultation period, the Agency invites Aboriginal groups to comment on the content, conclusions and recommendations of this comprehensive study report. The Agency will submit the comments it receives to the Minister of the Environment to support the Minister in making the environmental assessment decision.

If the environmental assessment decision is favourable, federal authorities could hold activities to consult with the affected First Nations on the authorizations to be issued for the implementation of the project, including compensation projects.

### **5.3 Consultation Activities held by the Provincial Government**

On May 21, 2013, the Quebec Minister of Sustainable Development, Environment and the Fight Against Climate Change asked the Bureau d'audiences publiques sur l'environnement to set up a commission of inquiry and hold public hearings. Public hearings were held in two stages, namely from August 27 to 30, 2013, and from September 24 to 28, 2013. A total of 150 submissions were filed during the hearings<sup>11</sup> by members of the public, various organizations, and the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John Innu.

### **5.4 Participation Activities held by the Proponent**

#### *5.4.1 Public consultation activities held by the proponent*

To initiate a formal dialogue with residents of the region, the proponent held a pre-consultation process from May to November 2012. The process led to a dialogue with close to 600 participants at 40 meetings. The purpose of these consultations was to provide plain-language, transparent information to stakeholders, enable the public to examine various aspects of the project and contribute to optimizing the project, and facilitate proactive follow-up on stakeholders' concerns, comments and suggestions.

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<sup>11</sup> [Bureau d'audiences publiques sur l'environnement](#). 2013. Projet d'ouverture et d'exploitation d'une mine d'apatite à Sept-Îles, website accessed in October 2014.

The pre-consultations focused on sectorial meetings and themed public workshops that provided an opportunity for direct discussion between experts and participants, as well as sessions for validating the results of the pre-consultation.

The proponent is continuing its dialogue with the local community. It has a liaison office in Sept-Îles and is a member of the Air Quality Issue Table and the Municipality-Business Round Table, which includes the municipalities of Sept-Îles and Port-Cartier and the regional county municipality of Sept-Rivières. An advisory and follow-up committee for the project has also been created.

#### **5.4.2** *Aboriginal consultation activities held by the proponent*

In June 2010, the proponent launched a discussion and consultation process with the Uashat mak Mani-Utenam First Nation with regard to the project. Regular exchanges with that community have been held since that date. The proponent has had roughly 100 communications with the community (letters, emails, meetings, and visits to the mine site). Note that the proponent states that it has participated in 10 meetings with the Uashat mak Mani-Utenam Band Council and held 3 public information sessions on the project and its impacts, which were attended by a total of about 30 community members. Lastly, the Uashat mak Mani-Utenam First Nation submitted a series of technical questions to Mine Arnaud on April 26, 2013. The proponent answered all of the questions in a document that was made public in July 2013 (Mine Arnaud inc. and Genivar. 2013g).

The proponent did not initiate a formal consultation process with the Innu First Nation of Matimekush-Lac John.

### **5.5** **Concerns raised**

The Agency took the concerns and comments expressed by the public and the two Innu First Nations into consideration in its analysis and also forwarded them to the proponent. Those issues will be addressed in the relevant sections of the report (Chapters 7 and 8 and Appendix G).

The main themes cited by the public were the following: impacts of effluent discharge to Clet Creek and Sept-Îles Bay, particularly on eelgrass beds and sediment; impacts of atmospheric pollutants on air quality and the drinking water source of des Rapides Lake; impact of blasting on marine species; impact of noise; cumulative impacts of the project; effects of the environment, including climate change, on the project; and risk of accidents and malfunctions.

In addition to raising the same concerns as the public, the two Innu First Nations identified the following issues: impacts of the project on their use of the territory (particularly hunting, trapping, fishing and harvesting); and effects on health because of noise, dust and water contamination.

Furthermore, the Uashat mak Mani-Utenam First Nation believes that the cumulative effects assessment should take into account all development projects that have occurred in the past 50 years within the entire traditional territory subject to their land claim. In their opinion, development has caused pollution and has fragmented and opened up the land, consequences that they feel have had many adverse effects on land use and the Innu way of life.

According to the Uashat mak Mani-Utenam First Nation, the various discussions and communications with the Agency have certainly given the community an opportunity to express their objections, concerns and comments

about the project, but the Innu First Nation is still not comfortable with the level of risk and the potential impacts posed by the project.

## **5.6 Accommodations and Agency's Conclusion on the Impact on Aboriginal Rights**

The environmental impact statement as well as the information provided to the Agency during the Aboriginal consultations demonstrates that the project is likely to have adverse effects on Aboriginal rights and the potential title of Uashat mak Mani-Utenam and Matimekush-Lac John. Indeed, the project is likely to cause losses of areas within the lands used for traditional purposes in the portion of the local study area affected by the mining infrastructure. Prior to the application of mitigation measures, the project was also likely to cause impacts on fish and wildlife, contamination of resources by dust and discharges into water bodies and watercourses, as well as noise disturbance of users of the area, in particular in the sector of Sept-Îles Bay, a valued area where several traditional activities are practised.

The proponent and the Government of Canada have identified measures intended to mitigate the issues raised by Aboriginal groups during the environmental assessment. These mitigation measures constitute accommodations concerning the impacts of the project on the potential rights of Aboriginal communities. These measures relate in particular to human health, water resources, fish, wildlife, the progressive restoration of the site and use of the land. They are described in Chapter 7 and in Appendix B of this report. Responses to each of the concerns of the Aboriginal groups are also provided in Appendix G.

Although the great majority of the losses of areas within the lands used for traditional purposes will be temporary owing to the restoration of the mining site, 167 ha will be permanently lost in the sector of the pit. The Agency is of the opinion that these losses of use of the area will not compromise the use of the lands for traditional purposes and will have a minor impact on the continuity of the way of life of the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John.

The Agency considers that the impacts of the project on the coastline of Sept-Îles Bay and on the bay itself will be low and should therefore not hinder the practice of traditional activities by the two Innu First Nations. In fact, this area will not be directly affected by the mining facilities and, consequently, no direct loss of use of this area is anticipated. The disturbance of the acoustic environment could however inconvenience the users of the area in the practice of certain traditional activities. However, this disturbance would be limited in space (2 to 3 km along the coastline of Sept-Îles Bay) and in time, i.e. until construction of the screening mound is completed (fifth year of the operation phase).

On the basis of the application of the mitigation measures, the Agency concludes that the potential adverse effects of the project on Aboriginal rights and on the potential title will be avoided or satisfactorily mitigated.

## 6 Environmental Setting

### 6.1 Biophysical Environment

The Arnaud Mining Project is located in the Canadian Shield, more specifically in the Grenville geological province. In addition to apatite deposits, the area contains high concentrations of titanium, uranium and iron. The landscape of the area was formed as the result of North America's last ice age, which ended approximately 7,000 years ago. The landscape features moraines, till ridges and knolls, intersected by lakes and streams, as well as mountains and glacial, marine, littoral and fluvial plains. The project site is dominated by the first two types. The Sept-Îles region is located in a subarctic climate zone. This zone is characterized by long, cold winters, shorter, cool summers, and lower precipitation. However, the coastal plain of the Sept-Îles region has a marine climate influenced by proximity to the Gulf of St. Lawrence, and precipitation is therefore higher.

The Arnaud mine site is located in the boreal forest on the boundary between two bioclimatic domains, namely the spruce–moss domain and the balsam fir–white birch domain. The forest canopy typical of the local study area is dominated by balsam fir and black spruce stands, on soil primarily covered in lichen and moss. White birch and trembling aspen are also found at sites with moderate moisture content.<sup>12</sup>

Terrestrial forest stands cover most of the local study area. However, wetlands and aquatic environments play a prominent role in habitat diversification and contribute to the ecological value of the region. Most of the wetlands on the site are peat bogs. The local study area is home to many mammal, bird, reptile and amphibian species, which depend on the forests, lakes, rivers and wetlands for feeding and reproduction.

The drainage network of the local study area is characterized by the presence of the Hall River to the west, the des Rapides River to the east, Hall, Gamache and du Castor lakes to the north, and Sept-Îles Bay to the south (Figure 7). The water at the project site drains directly to Sept-Îles Bay through a series of streams, including Clet Creek and the streams numbered R2 to R11. Fish habitat is primarily used for feeding and, to a lesser extent, for reproduction. Generally speaking, the tributaries and lakes in the region contain populations of brook trout, a sportfish species. Spawning grounds for rainbow smelt are also present in the study area.

Because it contains diverse suitable habitat, the local study area is home to a number of amphibian and reptile species, more than 50 bird species, and about 20 terrestrial mammal species, mainly fur-bearing animals prized by trappers. Furthermore, the area is frequented by 3 bird species designated as species at risk under the *Species at Risk Act*: the Common Nighthawk, the Olive-Sided Flycatcher and the Barrow's Goldeneye.

The local study area also includes Sept-Îles Bay, which is recognized provincially for the presence of wetlands of ecological importance and is part of the Sept-Îles Important Bird Conservation Area. In particular, the bay includes an eelgrass bed. This plant is recognized as a species of ecological interest. The coastline of the bay provides larval retention habitats for many fish species.

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<sup>12</sup> [Department of Forests, Wildlife and Parks](#) Website accessed in September 2014.



Figure 7 Location of lakes and rivers in the local study area



Source: Mine Arnaud 2015

## 6.2 Human Environment

The Côte-Nord region is occupied by the Innu and Côte-Nord communities. The Arnaud Mining Project is located entirely within the regional county municipality of Sept-Rivières. The project would fall within the municipality of Sept-Îles, which has a population of about 25,000 (Statistics Canada 2011), as well as two Aboriginal reserves, Uashat and Maliotenam, which have an Innu population of more than 3,000 (Uashat mak Mani-Utenam).<sup>13</sup> More specifically, the mining project would be situated north of the Arnaud Township sector, a low-density coastal residential area located along Route 138. In addition, the local study area includes about 15 cottages. The northern part of the project would also affect the unorganized territory of Lac-Walker and the Matimek Controlled Harvesting Zone.

The economy of Sept-Îles relies primarily on the industrial, commercial services, health care and educational activity sectors, as well as retail and wholesale trade. The area is largely dedicated to forest, hydroelectric, wildlife and mining resource development.<sup>14</sup> The resource-based industry sector is more significant in Sept-Îles than in the rest of Quebec because of the number of companies operating in fields related to aluminum processing and iron mining.<sup>15</sup>

Owing to its geographic location, Sept-Îles occupies an economically strategic position along the St. Lawrence Seaway, with substantial transport infrastructure (rail lines and port terminals). The Port of Sept-Îles, the largest ore port in Canada,<sup>16</sup> has 13 docks. Approximately 23 Mt of goods, primarily iron ore, pass through the port each year. The port also handles alumina, aluminum, petroleum coke, limestone and other goods, as well as more than 400,000 t of petroleum products.

The mining project is located on territory that is subject to a comprehensive land claim filed by the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John, the latter community being located 500 km north of the mining project. Originally nomadic hunters who roamed the Nitassinan (Innu territory), the Innu people are still heavily influenced today by the traditional culture and lifestyle of their elders. According to the Innu community, members frequently engage in traditional activities, such as salmon fishing, Canada goose and caribou hunting, and trapping of certain animals, including beaver. Members still use their mother tongue, but most speak French as a second language (Uashat mak Mani-Utenam).<sup>17</sup>

The local study area falls outside the boundaries of the Sept-Îles division of the Saguenay Beaver Reserve, within which the Innu of Uashat mak Mani-Utenam hold exclusive fur trapping rights. South of that zone, trapping is also carried out on two types of traplines: a “free” zone, which extends from the littoral zone to the southern

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<sup>13</sup> [Innu Takuaikan Uashat mak Mani-utenam Band Council](#) Website accessed in September 2014.

<sup>14</sup> [Développement économique Sept-Îles](#) Website accessed in September 2014.

<sup>15</sup> [RCM of Sept Rivières](#) Website accessed in September 2014.

<sup>16</sup> [Sept-Îles Port Authority](#) Website accessed in September 2014.

<sup>17</sup> [Innu Takuaikan Uashat mak Mani-utenam Band Council](#) Website accessed in September 2014.

boundary of the power line corridor; and registered traplines assigned by the Quebec Department of Energy and Natural Resources (MERN).<sup>18</sup>

The economy of the Innu of Uashat mak Mani-Utenam is largely dependent on the public sector. The band council, which accounts for a total of close to 267 permanent jobs and 600 seasonal jobs, is the largest employer of the Innu of that community and one of the largest in the Sept-Îles region. The two reserves are also home to some 50 businesses specializing in various fields, including food service, commercial fishing and seafood processing, sewing, canoe making, campground development and management, landscaping, heavy machinery, electricity, management services and translation.

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<sup>18</sup> The project affects traplines 09-11-0320, 09-11-0321 and 09-11-0326 in fur-bearing management unit (UGAF) No. 59 [Fédérations des trappeurs gestionnaires du Québec](#) 2011. Website accessed in September 2014.



## 7 Environmental Effects Assessment

### 7.1 Approach

The Agency, in collaboration with the Federal Environmental Assessment Committee (the federal committee), defined and assessed the adverse environmental effects of the project on the basis of the following information:

- the proponent’s environmental impact statement, including its answers to the questions and comments of the Federal Committee as well as the answers to the questions of the Quebec Department of Sustainable Development, the Environment and the Fight Against Climate Change (the province);
- information obtained during the public and Aboriginal consultations conducted by the Agency as well as those conducted by the Quebec Bureau d’audiences publiques sur l’environnement;
- expert opinions obtained from the authorities that are members of the Federal Committee as well as those provided by the province.

This chapter presents a summary of the environmental effects analysis for each valued component identified in Section 3.3 of this report.

The summary includes a description of the reference state (baseline) of the component and the potential environmental effects of the project on that component. Many of the mitigation measures proposed by the proponent to reduce the potential effects of the project have been integrated into the project design. Appendix B presents the mitigation measures that the Agency considers necessary to mitigate the environmental effects of the project.

In order to reach a conclusion on the significance of the residual effects, the Agency used the criteria of magnitude, extent and duration described in Appendix C<sup>19</sup>. The criterion of reversibility was integrated in the criterion of duration. Insofar as possible, the Agency also took into account the applicable federal and provincial regulatory standards, criteria and/or guidelines to determine the magnitude of the effects. Appendix E summarizes the provincial and federal regulatory frameworks that apply to each valued component.

The combinations of the criteria of magnitude, extent and duration used to determine the significance of the effect, which are presented in Appendix D, allow an overall judgment to be made on the significance of the effect according to a three-point scale: high, moderate and low. Environmental effects at the high level are considered significant, while effects at the moderate and low levels are considered not significant. Appendix E summarizes the potential environmental effects on the valued components, the mitigation measures as well as the Agency’s conclusions on the significance of any residual environmental effects. The follow-up program directions are presented in Chapter 8.

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<sup>19</sup> The use of these criteria is recommended in the [Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects](#) (Canadian Environmental Assessment Agency, 1994).



## 7.2 Human Health

This section deals with the repercussions that the environmental effects of the project could have on human health. This valued component takes into account both the persons and the communities likely to be affected by the effects of the project, particularly on the acoustic environment, air quality, greenhouse gases and drinking water quality.

### 7.2.1 *Potential environmental effects*

The main sources of potential effects on human health are the changes to the atmospheric environment (air quality and acoustic environment) and the discharges into drinking water sources. Although these changes would be apparent from the beginning of the project construction phase, it is anticipated that they would be more pronounced during the operation phase and would decrease following closure of the mine.

The effects are assessed based on the applicable standards and criteria established to protect human health (see Appendix F) and taking into account the degree of exposure of the population likely to be affected by the changes to the atmospheric environment and to water resources.

#### *Air quality*

The project is located in a coniferous forest zone less than 10 km from the urban areas (by air). Several dozen homes distributed along Route 138 (Arnaud Township) and cottages are located nearby. The current air quality at the project site is good; the only apparent sources of particulate emissions in proximity to this sector are from vehicular traffic. The proponent conducted measurements of ambient air quality in Arnaud Township from June to November 2012. The concentrations of fine particulate matter, total suspended particulates and metals measured were well below the air quality standards set out in the Quebec *Clean Air Regulation* (Mine Arnaud Inc. and Genivar, 2013e). In addition, the province conducted an air quality assessment campaign in downtown Sept-Îles between June 2012 and June 2013. The preliminary results indicate that the air quality measured in Sept-Îles is good and indeed is the best of all the stations in the Quebec air quality monitoring network.<sup>20</sup>

The main sources of particulate and metal emissions from the project would be related to the transport of ore and waste rock, drilling and blasting activities, exhaust gases from equipment, loading and unloading of ore and waste rock, and erosion of the tailings site, the waste rock pile, as well as the ore and overburden stockpiles.

In order to assess the impacts of the project on air quality, the proponent conducted a modelling study of the atmospheric dispersion of particulate emissions (total suspended particulates and fine particulate matter), of gaseous compounds (sulphur dioxide, nitrogen oxides) and of 21 metals and metalloids present in the mine tailings. This modelling examined two scenarios, corresponding to years 6 and 10 of mine operation, which were chosen in particular owing to the high rate of extraction, which is projected to attain 70,000 and 75,000 tonnes

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<sup>20</sup> Department of Sustainable Development, the Environment and the Fight Against Climate Change. 2013. [Évaluation de la qualité de l'air à Sept-Îles](#). Website accessed February 2015.

per day, respectively. For these two scenarios, the proponent modelled the atmospheric dispersion at the limit of application of the Quebec *Clean Air Regulation*<sup>21</sup> as well as at certain sensitive receptors.<sup>22</sup>

The modelling results show that the provincial air quality standards of the *Clean Air Regulation* are expected to be met. It is important to point out that the results correspond to the anticipated residual effects, since the modelling takes into account the implementation of all the mitigation measures proposed by the proponent (see Appendix B).

Table 3 presents the maximum concentrations anticipated for the contaminants which come closest to the limits of the ambient air quality standards and criteria (see Appendix F for more details). They correspond to year 10 of mine operation, when the mine will be producing at full capacity. According to the proponent, this maximum rate of production would be attained for eight years out of the 31 years of ore extraction. It is important to point out that the anticipated maximum concentrations presented in Table 3 take into account the implementation of a particular mitigation measure, namely interruption of transport of waste rock during certain specific weather conditions (see Section 7.2.2 for more details).

**Table 3 Anticipated maximum concentrations for the contaminants modelled**

Contaminant	Period	Standards / Criteria ( $\mu\text{g}/\text{m}^3$ )*		Anticipated maximum concentrations at the limit of application of the <i>Clean Air Regulation</i> ( $\mu\text{g}/\text{m}^3$ ) <sup>21</sup>	Anticipated maximum concentrations at the sensitive receptors ( $\mu\text{g}/\text{m}^3$ )
		Quebec	Canada		
Total suspended particulates (TSP)	24 hours	120	-	120	89
Fine particulate matter less than 2.5 microns ( $\mu\text{m}$ )( $\text{PM}_{2.5}$ )	24 hours	30	27 to 28 <sup>23</sup>	27.2	22.7
Nitrogen dioxide ( $\text{NO}_2$ )	1 hour	414	-	380	326.5
	24 hours	207	-	205.5	174.5
	Annual	103	-	50	36.4
Sulphur dioxide ( $\text{SO}_2$ )	4 minutes	1,050	-	184.4	155.7
	24 hours	288	-	50.9	50.2
	Annual	52	-	20	20

<sup>21</sup> For mining projects, compliance with ambient air quality standards must be assessed at an approximate distance of 300m from extraction and ore processing facilities located on public lands.

<sup>22</sup> There are 16 of these receptors, specifically, homes distributed along Route 138, cottages located to the northeast, near Gamache Lake, the Hall Lake campground and the drinking water intake of the town of Sept-Îles.

<sup>23</sup> The standard is 28  $\mu\text{g}/\text{m}^3$  effective in 2015 and will be lowered to 27  $\mu\text{g}/\text{m}^3$  in 2020. [Environment Canada](#). Website accessed February 2015.

Manganese	Annual	0.025 <sup>24</sup>	-	0.0353	0.0311
Chromium	Annual	0.004	-	0.00319	0.00296

\*(µg/m<sup>3</sup>): microgram per cubic meter

The results show that, with the exception of manganese and total suspended particulates, all the maximum concentrations modelled are below the applicable standards and criteria.

The results indicate that the annual average concentrations of manganese could exceed the interim provincial criterion for air quality, both at the limit of application of the *Clean Air Regulation* and for a few homes distributed along Route 138.

For three other substances, i.e. total suspended particulates, fine particulate matter (PM<sub>2.5</sub>) and nitrogen dioxide, the maximum concentrations modelled would be equal to or close to the standard of the *Clean Air Regulation* at the limit of application of this regulation. In addition, although the maximum concentrations of fine particulate matter modelled are below the standard prescribed by the *Clean Air Regulation*, they could exceed the Canadian Ambient Air Quality Standards<sup>25</sup> as of 2020 since this standard will be lowered to 27 µg/m<sup>3</sup>.

According to Health Canada data, repeated inhalation of high concentrations of manganese in dust is associated with disturbances of neurological function in adults and children,<sup>26</sup> while the inhalation of fine particulate matter and nitrogen dioxide can cause respiratory illnesses.<sup>27,28,29</sup>

In response to the concerns raised by the public and Aboriginal groups, the proponent conducted an assessment of the toxicological risks to human health posed by the dispersion of atmospheric emissions (Sanexen 2013). The objective of this study was to assess the health risks for the population living along the shore (Arnaud Township) caused by dust emissions (particulates and metals) and gas emissions (nitrogen and sulphur oxides). Various toxicity effects were taken into account, including those that can arise following short-term exposure by inhalation and those resulting from long-term exposure (cancer and other chronic effects). This study, which is based on atmospheric dispersion modelling of the contaminants, concludes that the project would not pose any significant health risk for the population living along the shore near the project or areas further away, for example, the Place Ferland trailer park and the urban core of Sept-Îles, including the community of Uashat mak Mani-Utenam.

In the case of manganese, the toxicological risks study indicates that the atmospheric modelling results tend to overestimate the risks associated with this contaminant. The province and the Federal Committee are in

<sup>24</sup> There is no standard in the *Clean Air Regulation* for manganese. This is an ambient air quality criterion established by the province. See Appendix F for more information on these criteria and standards.

<sup>25</sup> [Canadian Ambient Air Quality Standards](#) are health-based air quality objectives for pollutant concentrations in outdoor air. These are not regulatory standards.

<sup>26</sup> Health Canada. 2010. [Human Health Risk Assessment for Inhaled Manganese](#). Website accessed October 2014.

<sup>27</sup> [Employment and Social Development Canada](#). Website accessed October 2014.

<sup>28</sup> [Ontario Ministry of the Environment and Climate Change](#). Website accessed October 2014.

<sup>29</sup> Health Canada. [Fuels and Air Pollution](#). Website accessed October 2014.

agreement with this statement.<sup>30</sup> The proponent therefore opted for another methodological approach which it considers more appropriate for assessing the health risks of manganese emissions, i.e. to assess the modelling data by comparing them with analogous epidemiological data. The study concludes that the atmospheric emissions of manganese associated with the project should not result in any health effects over the short or long term.

The toxicological study recommends maintaining PM<sub>2.5</sub> values under 15µg/m<sup>3</sup> over 24 hours. This recommendation is motivated by the precautionary principle<sup>31</sup> since there is no known threshold below which it is proven that there is no effect on human health.

### *Greenhouse gas emissions*

Greenhouse gases, such as carbon dioxide, methane and ozone, are contaminants which are responsible for the increase in the greenhouse effect. They are recognized as being one of the causes of climate change that can have various impacts on human health in the short, medium and long term. Climate change poses various risks to human health associated with an increase in thermal stress and respiratory illnesses as well as the transmission of insect- and water-borne diseases.<sup>32</sup>

The proponent conducted an assessment of the direct emissions of greenhouse gases related to the project. The results indicate that the vast majority of the greenhouse gas emissions would come from the consumption of diesel fuel by mobile equipment. This mobile equipment would be used for the extraction and transport of ore on the mining site, as well as for the transport of other mine waste such as overburden, waste rock and tailings.

It is estimated that the project would emit a grand total of 885,000 tonnes of carbon dioxide equivalent (CO<sub>2</sub>eq), for an average of 38,000 t CO<sub>2</sub>eq/year, reaching a high to almost 50,000 t CO<sub>2</sub>eq during the 15th year of operation. These projections represent a level of greenhouse gas emissions on average more than 16 times below the average of the mining sector in Canada. The project would not be considered a major emitter, at either the provincial or federal level. Emissions will nonetheless have to be monitored, since the project would be subject to mandatory reporting at the provincial level. The project could also be subject to mandatory reporting at the federal level in the event that the threshold of 50,000 t CO<sub>2</sub>eq/year is exceeded (see Appendix F for more details).

### *Acoustic environment*

The proponent conducted two series of measurements of ambient noise levels (in 2011 and 2012), at two locations in Arnaud Township and in downtown Sept-Îles. These measurements demonstrated that the acoustic environment of Arnaud Township is affected by traffic on Route 138.

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<sup>30</sup> According to the study by Sanexen (2013), the toxicological reference values obtained in the form of total particulates to assess health risks overestimate the risks since only a fraction of the total particulates is respirable.

<sup>31</sup> The “precautionary principle” is a concept which supports taking protective action before there is complete scientific proof of a risk – [World Trade Organization](#). Website accessed October 2014.

<sup>32</sup> [World Health Organization](#). Website accessed July 2015.

The project would contribute to increased noise levels in the environment. Exposure to noise can cause effects on human health, particularly by causing annoyance and sleep disturbance.<sup>33</sup> The potential effects associated with noise and vibrations were assessed based on the noise criteria set out in provincial Directive 019 on the mining industry. The effects were also assessed based on the change in the percentage of persons highly annoyed by noise, a methodology suggested by Health Canada (see Appendix F for more information). The duration and frequency of exposure are also taken into account.

The main sources of noise and vibration would be related to the use of machinery for the construction and lay out of the mine, as well as for ore handling, storage and treatment. Other significant sources of noise would be the movement of trucks and the use of explosives.

In order to assess the noise levels that would be generated by the project, the proponent conducted a modelling exercise consisting of four simulations corresponding to the construction and operation phases for eight different receptors. The results demonstrated that noise levels should not exceed the limits permitted by Directive 019. The results also indicated that the change in the percentage of persons highly annoyed by the noise generated by the project is expected to be less than 6.5%, which corresponds to the acceptable limit under a methodology suggested by Health Canada for assessing the impacts of noise on human health. It is important to point out that the results correspond to the anticipated residual effects, since the modelling takes into account the implementation of all the mitigation measures proposed by the proponent (Appendix B).

The table below presents, for each receptor identified the projected sound levels which come closest to the limits set out in Directive 019.

**Table 4 Projected sound levels that approach the limits set out in Directive 019**

Receptor	Sound levels (dBA)			
	Daytime		Night-time	
	Sound level closest to the limits	Permitted sound level	Sound level closest to the limits	Permitted sound level
3710 Route 138	41	49	39	43
3542 Route 138	45	50	42	43
3408 Route 138	48	49	42	42
3330 Route 138	49	50	43	43
3220 Route 138	49	51	42	44
3074 Route 138	47	50	40	44
Cottage to the north	40	45	38	40

<sup>33</sup> [World Trade Organization](http://www.wto.org). Website accessed October 2014.

Hall Lake campground	29	50	29	45
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Although sound levels are not expected to exceed the permitted limit, the modelling results show that the projected sound levels would be close to the permitted limits for certain homes located along Route 138. The highest sound levels, closest to the limits permitted by Directive 019, would extend over a distance of 2 to 3 km from the location of the pit. This noise would be apparent in the construction phase and at the beginning of the operation phase, i.e. until the screening mound is completed.

Finally, the blasting required in the mine construction and operation phases would cause vibrations. According to Directive 019, the maximum permitted velocity of ground vibrations is 12.7 millimetres/second (mm/s) and the maximum air pressure threshold is 128 dBA. According to the modelling carried out by the proponent, the vibrations and projection distances of the projectiles caused by the blasting would meet the acceptable limits at the closest homes and at the Hydro-Québec transmission towers, and should not cause any structural damage. The proponent anticipates that vibration velocities will be approximately 5 mm/s and that the maximum air pressure threshold will not be exceeded.<sup>34</sup>

#### *Drinking water*

The population of the town of Sept-Îles receives its water supply from a water intake located in des Rapides Lake at a depth of approximately 10 m. This water intake is located approximately 6 km from the main mine infrastructure.

The contamination of drinking water by chemical substances could have an impact on the health of the population. In the context of the project, two types of potential contamination of drinking water were studied, namely contamination by atmospheric emissions and contamination by groundwater or surface water.

Concerning the possible effects associated with atmospheric emissions, the drinking water intake in des Rapides Lake was added as a sensitive receptor in the modelling of atmospheric dispersion. The results indicate that the contribution of mine activities would be negligible for all the contaminants modelled. In its 2013 report, the Bureau d'audiences publiques sur l'environnement pointed out that the low level of potential emissions of acidifying contaminants generated by the mine should not contribute to acidification of the lake. It is unlikely that the atmospheric emissions associated with the project will have an impact on the water quality of des Rapides Lake, even for the maximum concentrations calculated under the weather conditions most unfavourable to dispersion.

The des Rapides Lake drinking water source would also not be contaminated by surface water runoff from the mining site, since the lake is located in a different watershed from the one in which the project is located. Hence, there is no possibility that runoff from the mining site and mine effluent could drain in the direction of the lake.

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<sup>34</sup> Bureau d'audiences publiques sur l'environnement. [Projet d'ouverture et d'exploitation d'une mine d'apatite à Sept-Îles: Séance tenue le 28 août 2013](#). Website accessed October 2014.



It is unlikely that des Rapides Lake would be contaminated by groundwater since the network of faults identified and groundwater flow do not indicate potential connectivity in the direction of des Rapides Lake, which is located 6 km to the northeast of the centre of the pit. For more details on groundwater, see Section 7.3.

The proponent also surveyed all the private wells recorded in the province's hydrogeological information system database. These wells are all located more than 7 km from the mining site and are located outside the seven sub-watersheds of the mine property. The risk of contamination of these wells as a result of mining activity appears to be very low.

However, residents of private properties located downstream of the mine property along Route 138 pointed out that there are three un-surveyed surface wells in use less than 3 km from the mining infrastructure. The proponent considers that any impact on the water quality of these wells would be unlikely since all the water from the site will be collected, treated and discharged into Clet Creek. Furthermore, two of the three wells are not located directly downstream of the project.

Concerning the possibility of contamination of these wells by atmospheric emissions, the atmospheric modelling for total suspended particulates indicates that concentrations on the order of 10 to 20 micrograms/cubic meter ( $\mu\text{g}/\text{m}^3$ ) could be present in the ambient air at the location of the wells closest to the mining facilities during operations (worst-case scenario). These concentrations are below the standard of  $120 \mu\text{g}/\text{m}^3$  prescribed by the *Clean Air Regulation*. The potential impact on the water quality of the wells as a result of atmospheric emissions fall-out is therefore considered low.

### 7.2.2 Mitigation measures

The proponent has agreed to apply several measures (Appendix B) to reduce the changes to the atmospheric environment.

To mitigate the project's effects on air quality, the proponent will implement a dust management plan including various measures recognized as effective. In addition, the proponent has agreed to adopt a particular mitigation measure, namely interruption of the transport of waste rock during specific weather conditions (i.e. during conditions of calm winds from the north).<sup>35, 36</sup> This is an essential measure in order to prevent levels from exceeding the standards, notably with respect to total suspended particulates, fine particulate matters and chromium.

In order to reduce the project's greenhouse gas emissions, the proponent plans to institute various energy-saving and conservation methods relating to ore transport activities. In addition, hydroelectric power will be used as the main energy source for all ore-processing activities and all the wood from the clearing of the mining site will be re-used or recycled.

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<sup>35</sup> The stronger the wind, the lower the pollution levels will be. Conversely, a low wind speed promotes local accumulation of pollutants. A light wind from the north would send the atmospheric emissions in the direction of Route 138 and the year-round residences located there. (N. Diaf et al., 2003)

<sup>36</sup> The proponent will use the indicators from continuous air quality monitoring to determine whether the transport of waste rock should be temporarily interrupted owing to the weather conditions.

The proponent has also agreed to take steps to reduce noise, including construction of a screening mound during the first five years of the project along the entire south side of the pit, as well as the use of mufflers and low-noise mining equipment. Concerning the vibrations caused by explosions, certain steps will be taken to mitigate the adverse impacts of blasting. For example, the proponent has agreed to carry out blasting only once a day, at a specific time, which will be limited in duration.

### *7.2.3 Government, public and Aboriginal comments and proponent's response*

Members of the public, including residents living near the mine, as well as the First Nations, expressed several concerns about the potential impacts on human health that could result from the effects of the project on air quality, the acoustic environment and drinking water.

Members of the public are concerned in particular about the potential for levels to exceed air quality standards or criteria. For example, the Société pour vaincre la pollution pointed out that the proponent underestimated the quantities of explosives required and that nitrogen dioxide (NO<sub>2</sub>) emissions during blasting would therefore be higher than projected. According to the proponent, the atmospheric dispersion modelling assumed more explosives than necessary for the planned rate of extraction. Health Canada is of the opinion that blasting misfire accidents and failures could occasionally result in abnormally high concentrations of NO<sub>2</sub>. The proponent has agreed to include this substance in the monitoring program. In addition, as indicated in the dust management plan, the proponent has agreed to take weather conditions into account in managing the blasting in order to prevent levels from exceeding air quality standards.

Concerns were also expressed about the possible presence of crystalline silica in the mine's atmospheric emissions and its potential effects on human health. The proponent indicates that the most abundant form of crystalline silica naturally present is in the form of quartz. However, the nature of the ore and the bedrock at the project site indicate a total absence of quartz. This information has been confirmed by experts from the Quebec's Department of Energy and Natural Resources, as well as by Michel Gauthier, a geologist and professor at the Université du Québec à Montréal. The Agency therefore considers the risks of health effects caused by crystalline silica to be nil.

Environment Canada raised numerous questions intended to clarify the modelling of the atmospheric dispersion of particulates. Despite the additional information provided by the proponent, some uncertainties remain. In particular, the federal committee is of the opinion that the projected 91% rate of reduction in dust emitted used in the atmospheric dispersion modelling is optimistic and that the predicted concentrations of contaminants in the air may have been underestimated. Considering these uncertainties and taking into account the concerns of the public and of the First Nations about the potential impacts of the project on health, the Agency considers that an air quality monitoring program will be necessary during all phases of the project. The Agency notes that, in order to meet the provincial requirements, the proponent must institute an air quality monitoring program

and adjust the mitigation measures in the event that levels exceed the standards prescribed by the Quebec *Clean Air Regulation*.<sup>37</sup>

Concerning the impacts of the project on the acoustic environment, one environmental group pointed out that despite the mitigation measures proposed by the proponent, the noise emitted by the mining operations would be at the limit of the permitted thresholds. The proponent has proposed an acoustic environment monitoring program to verify compliance with noise and vibration standards. The Agency notes that this monitoring program will be supervised by the province. The Agency also notes that the proponent will implement a complaint resolution system, which should make it possible to adjust the mitigation measures based on the local context, if necessary.

A number of concerns were expressed by citizens and by the Innu community of Uashat mak Mani-Utenam about the effect of atmospheric emissions on des Rapides lake, which is the drinking water source for the municipality of Sept-Îles. The proponent's modelling demonstrates that the dispersion of dust or acidifying gases (nitrogen dioxide and sulphur dioxide) would be negligible for this area.

#### *7.2.4 Agency conclusions on the significance of the residual environmental effects*

The changes to the atmospheric and acoustic environment caused by the project would have a negligible impact on the health of the great majority of the population of Sept-Îles as well as on the health of the community of Uashat mak Mani-Utenam. Some residents living near the mining site could be exposed during the construction phase and throughout the period of operation of the mine to certain atmospheric contaminants and to noise from the mining activities. Exposure to atmospheric contaminants would be higher in the eight years during which the mine is projected to be operating at full capacity (years 7 to 14 of production), while the exposure to noise will be more pronounced in the construction phase and at the beginning of operations. However, the proponent has demonstrated that the project is expected to meet all the applicable regulatory standards intended to protect human health, including at the locations of the closest homes. The Agency concludes that the atmospheric emissions and sound levels emitted by the project would not cause significant effects on human health.

However, this conclusion is conditional on the strict application by the proponent of all the mitigation measures described in Appendix B as well as on compliance with a condition of the provincial order authorizing the project which requires that the proponent not exceed the maximum extraction rate of 75,000 tonnes/day.

Implementation of the monitoring program will make it possible to validate the predictions and, if necessary, to ensure that additional mitigation measures are instituted in order to protect health. This is very important since in the absence of these mitigation measures, the modelling demonstrates that the project would likely generate atmospheric emissions (total suspended particulates, fine particulate matters and chromium) and noise levels that exceed the standards and criteria for certain homes.

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<sup>37</sup> Monitoring is required for suspended particulates (TSP, PM<sub>2.5</sub> and PM<sub>10</sub>) and nitrogen dioxide. The continuous monitoring of total suspended particulates (TSP) will also enable the proponent to modify mine activities when the values approach the standards.

Concerning the atmospheric emissions of manganese, the Agency agrees with the conclusion of the proponent's toxicological risks study to the effect that these emissions should not result in any health effects over the short or long term.

The Agency also concludes that no impact is anticipated on des Rapides lake drinking water source, whether from the atmosphere or through groundwater or surface water. In addition, the Agency considers that contamination of the water in private wells located near the project would be unlikely.

Taking into account the implementation of the mitigation measures, the Agency concludes that the project would not be likely to cause significant adverse environmental effects on human health.

### 7.3 Water Resources

This valued component includes surface water and groundwater, from the standpoint of both quality (particulate, nutrient and contaminant loading) and quantity (hydraulic regime). The issue related to this component is to determine if the quantity and quality of water will remain adequate in the local study area to support aquatic life and terrestrial wildlife as well as for human use.

#### *Surface water*

Most of the streams near the planned mining facilities drain areas of less than 1 km<sup>2</sup>. However, four streams drain larger areas, namely Clet Creek, R10, R11 creeks, and Gamache Creek (see Figure 7). The lakes in this area are small and drain small watersheds.

The proponent conducted a characterization of the quality of surface water and sediments in the local study area in 2010, 2011 and 2013.<sup>38</sup> The results demonstrated that the surface water is generally of good quality. This water is generally acidic and did not contain suspended sediment at the time of sampling. The water in the local study area also shows low alkalinity and hardness levels and is also very poor in nutrients, particularly nitrogen and phosphorus. This surface water generally contains few metals and metalloids, since the levels measured were generally below the limits of detection of the analytical methods used. Values exceeding the criteria were, however, observed in the case of aluminum, iron, cadmium and manganese.<sup>39</sup>

#### *Groundwater*

The proponent described the two main hydrogeological systems observed in the project area. The first system is observed at depth in the rock formations and exhibits variable hydraulic conductivity.<sup>40</sup> The second system is encountered near the soil surface and is composed mainly of clayey silt of variable thickness and exhibits low hydraulic conductivity. Consequently, exchanges between groundwater and surface water are limited owing to the presence of unconsolidated deposits at the surface which are composed of low-permeability materials (clayed silt).

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<sup>38</sup> In 2013, the characterization was limited to stream R8.

<sup>39</sup> The water quality results were compared with the Canadian Water Quality Guidelines for the Protection of Aquatic Life and with the Quebec criteria for the protection of aquatic life and for the prevention of contamination (with water intake). See Appendix F for more details.

<sup>40</sup> Hydraulic conductivity is a parameter that quantifies the intensity of a flow in a porous medium under the influence of a hydraulic gradient.

The proponent identified five fault zones on the mining site, three of which contain faults oriented northwest-southeast, associated with watercourses that flow into Sept-Îles Bay, in particular Clet Creek. These faults suggest the existence of a potential hydraulic connection between the mining site and the bay. These links could promote the movement of water between the mining site and the bay.

The groundwater quality in the area generally appears to be good. Almost all the physicochemical parameters of the water meet the provincial water quality criteria. It should be noted that the total phosphorus and phosphate concentrations in groundwater are low, which may be explained by the low solubility expected of the apatite contained in the rock formations.

### 7.3.2 *Potential environmental effects*

The main potential effects of the project on the quality and quantity of water include the contamination of surface water and groundwater by leachates,<sup>41</sup> chemical substances, sediments and the intrusion of saltwater or brackish water, as well as the loss of water bodies and streams, and alteration of runoff and natural flow.

#### *Effects on water quality*

The land area devoted to the development of the mining infrastructures is approximately 1,285 ha. The site preparation activities would involve reworking the natural soils and would promote erosion of the remaining soils. The movement of machinery could also cause soil compaction and generate fine particulate matters, which also promote erosion. This erosion could result in sediment loading (and loading of any associated contaminants such as nitrogen, phosphorus and metals) in nearby water bodies through runoff and alter the quality of aquatic habitats. A portion of this runoff could also infiltrate into the soil and reach the groundwater by percolation.

The various tailings cells, the waste rock pile, the screening mound, the overburden accumulation area and the settling basin could discharge potentially toxic water which could run off and contaminate various water bodies (e.g. during periods of heavy rain). This water could also contaminate groundwater if toxic substances percolate through the soil. Generally, the production of a leachate following the percolation of water through the tailings and other mine waste constitutes one of the main sources of potential impacts of mining projects on surface water and groundwater.

The proponent assessed the potential of acid mine drainage and of leaching of the various excavated materials (ore, overburden, tailings, waste rock). The results indicate that none of the materials tested would pose a risk of generating acid mine drainage.<sup>42</sup> The geochemical characterization of the materials demonstrated that aluminum, cadmium and iron could be leached at concentrations that exceed the Canadian Water Quality

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<sup>41</sup> Leachates: in the context of a mining site, this refers to water in contact with mine waste (tailings, waste rock, overburden and ore) which can run off or infiltrate into the soil and reach the aquatic environment or groundwater.

<sup>42</sup> Certain rocks, such as sulphide minerals, when exposed to air and water, undergo a relatively slow chemical oxidation which tends to acidify the environment. This acidification facilitates the proliferation of bacteria which accelerate the oxidation reactions, thereby causing acidification of the water, which can dissolve the heavy metals contained in sulphide minerals. This problem, called acid mine drainage or acid rock drainage, can result in contamination of water resources over a long period. It is particularly important to consider this in the context of the Arnaud project since, owing to the low alkalinity of the water, it can be easily altered by acid loading (excerpt taken from the proponent's environmental impact statement).

Guidelines for the Protection of Aquatic Life. The leaching tests also demonstrated that there is a risk that phosphorus may be present in the aquatic environment at concentrations that can cause eutrophication of the environment, and that fluoride may be present at concentrations that may be toxic to aquatic life. Vanadium could also be present in the environment. According to the information provided by the proponent, the compound titaniferous magnetite contains vanadium in the form of divanadium pentoxide at a concentration of 0.39%. This form of vanadium has been added to the list of toxic substances under the *Canadian Environmental Protection Act* (see Appendix F).

Clet Creek could be contaminated since it would be the only watercourse receiving mining effluent from the wastewater treatment plant. Since Clet Creek flows into Sept-Îles Bay, the bay would receive the contaminants of the mining effluent. The proponent anticipates that the mining effluent will meet the standards set out in the *Metal Mining Effluent Regulations* and in Directive 019, and would comply insofar as possible with the provincial effluent discharge objectives.<sup>43</sup>

Owing to its depth and its proximity to Sept-Îles Bay, the pumping of water from the pit (dewatering) could result in lateral saltwater intrusion as well as vertical intrusion of deep brackish water,<sup>44</sup> with the result that the water pumped from the pit (dewatering water) could adversely affect the quality of the water discharged into Clet Creek.<sup>45</sup> According to the hydrogeological modelling work carried out by the proponent, it is probable that a portion of the water pumped from the pit will be saltwater. This saltwater intrusion is anticipated toward the 15th year of operation, i.e. when the depth of the pit will have reached sea level. The maximum proportion of saltwater would be attained in the 28th year of operation and is estimated at approximately 7% of all the dewatering water.

The explosives used to extract the rock are of the ammonium nitrate/fuel oil emulsion type. This type of explosive is composed of approximately 20% nitrogen in the form of ammonium nitrate. The dissolution of this substance in water represents an issue owing to the effects of nitrates and ammonia on health and aquatic life.<sup>46</sup> Although this type of explosive is partly composed of oil and is therefore very insoluble in water, small

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<sup>43</sup> The effluent discharge objectives are concentrations and loads that may be discharged into an aquatic environment and which take into account the characteristics of the discharge and of the receiving environment as well as the level of quality necessary to maintain the uses of the water. The province encourages proponents to consider these objectives as a target for continuous improvement (see Appendix F).

<sup>44</sup> Brackish water is slightly to moderately salty water. Its salt content is between 1 and 10 g/L, versus 35 g/l on average for seawater. Brackish water can appear following the meeting of masses of freshwater and saltwater. [Futura-sciences.com](http://Futura-sciences.com). Website accessed September 2014.

<sup>45</sup> In coastal areas, the process of saltwater intrusion in an aquifer occurs when the groundwater level at a given point on the coast is below sea level. The freshwater-saltwater transition zone (interface) within the aquifer is then shifted inland. This situation can occur following the pumping of a well, but also by drainage of a pit, as in the present case. The risk of saltwater intrusion decreases rapidly with greater distance from the coast, as the elevation of the groundwater surface increases relative to sea level (excerpt taken from the proponent's environmental impact statement).

<sup>46</sup> Forsyth, B., A. Cameron and S. Miller. 1995. Explosives and water quality, in Proceedings of Sudbury '95 Mining and the Environment. p. 795-803



quantities of ammonium nitrate could be released into the dewatering water and/or carried by air to watercourses in the vicinity during loading or explosion.

The presence of a petroleum products storage area and of a mechanical workshop, the use of machinery as well as vehicular traffic would be likely to pose a risk of spills of petroleum products, which could result in the contamination of surface water and groundwater.

Finally, although the apatite would be transported to the Port of Sept-Îles by rail in fully enclosed railway cars and the unloading station would be located inside a building, an accident or malfunction (e.g. a leak or spill) could result in the runoff of contaminated water toward the water of Sept-Îles Bay in the Pointe-Noire area.

#### *Effects on water quantity: alteration of the hydraulic regime*

The mining infrastructure would encroach on three lakes (PE-1, PE-2 and PE-3), which would be permanently lost, as well as on several segments of streams, for a total loss of area of approximately 7.9 ha (see Figure 7).

Operation of the pit, and associated pumping of the dewatering water, would cause a drawdown of the water table around the periphery of the mining site (a lowering of the groundwater level). Generally, the presence of a hydraulic connection between groundwater and surface water can result in a reduction in the availability of surface water and, consequently, dry out wetlands and affect nearby water bodies (reduction of water levels and flows). Such a reduction, when it occurs, can lead to a degradation of the habitats of aquatic, bird and even terrestrial wildlife.

The proponent conducted hydrogeological modelling in order to determine the probable effect of the drawdown of the water table on the water bodies and watercourses in the study area. During the operation phase, the zone of influence of pit dewatering on the water table would extend up to 1.6 km around the pit, including Sept-Îles Bay, but would not affect any lakes. The dewatering would eliminate groundwater inputs into several streams located around the periphery of the pit and would reduce groundwater input into Gamache Creek by 40%.

The presence of the mine infrastructure would also reduce the area of the watersheds of certain lakes and streams. This would result in a reduction in the volumes and flows of runoff water. Runoff from the impoundment and storage areas would be intercepted and redirected to the settling basin, to be recirculated to the concentrator or treated at the wastewater treatment plant. The surface occupied by these project components would therefore no longer contribute to the natural runoff of certain watercourses. However, the flow of Clet Creek would be altered right after construction of the dam and settling basin. Downstream of the dam, the creek would receive all the treated water from the mining site, which would increase its flow by more than 30%.

In short, the water levels and flows of the lakes and streams in the zone of influence of the project would decrease owing to a combined reduction in groundwater and surface water inputs. The anticipated decrease in flow of various streams within the study area would range from 85% for stream R9 to 5% for Hall River. This would result in impacts on fish and fish habitat, which are assessed in Section 7.4 of this report.

### 7.3.3 Mitigation measures

The proponent has agreed to apply several mitigation measures (see Appendix B) in order to reduce the impacts on water resources.

The proponent plans to install a system of collecting ditches around the mining infrastructure in order to capture the water from the site. All the water from the site collected in the settling basin will be treated<sup>47</sup> to ensure that it meets the standards of the federal *Metal Mining Effluent Regulations* and the criteria of provincial Directive 019 before being discharged into Clet Creek. The proponent agrees to take steps to ensure that the concentrations of the deleterious substances contained in the effluent trend toward with the provincial effluent discharge objectives.

The proponent also plans to install ditches to receive runoff on the site of the port infrastructure in order to prevent the discharge of deleterious substances into the bay. A quality monitoring program of water around the perimeter of the port facilities will make it possible to determine whether it will be necessary to treat the collected water before its eventual discharge into the Sept-Îles Bay.

The proponent has agreed to implement a set of sediment and erosion control measures in order to prevent discharges of sediments into the aquatic environment. The proponent specifically undertakes to adjust effluent discharges, with the goal of simulating the natural hydrological pattern of Clet Creek, with some routing of the spring flood. The proponent will comply with the provincial regulations "*Règlement sur les normes d'intervention dans les forêts du domaine*" which includes many measures and good practices to reduce the release of sediment and erosion.

Certain explosives management measures will be instituted to prevent and minimize the impact on water resources. Steps will be taken in particular to optimize the blast pattern and the technique used for filling the blast holes. Any water contaminated by the use of explosives would end up in the mine drainage water, would be redirected toward the settling basin and would be treated at the wastewater treatment plant before being discharged into the environment.

The risk management program will help reduce the risks of accidents and malfunctions, and the emergency plan will minimize the impacts on water resources, where applicable (see Section 7.10).

In order to minimize the impacts on the level of the water table, the proponent has agreed to use a dewatering strategy intended to minimize the drawdown of the water table, i.e. to pump only the water from the pit, rather than creating a ring of wells around the pit.

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<sup>47</sup> Briefly, the treatment includes an initial physicochemical step consisting of settling, neutralization and coagulation-flocculation, followed by settling with sludge thickening. A second membrane nanofiltration step would be reserved solely for the water used to prepare the reagents. Any excess water not recirculated to the concentrator would be discharged into Clet Creek after the first treatment step.

### 7.3.4 *Government, public and Aboriginal comments and proponent's response*

Several members of the public and of the Aboriginal communities expressed concerns about the potential effects of the Project on Sept-Îles Bay and in particular about nutrient and suspended solids loading in the mining effluent. This issue is discussed in Section 7.4 of this report.

The First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John raised concerns about the contamination of groundwater by the tailings cells. The proponent conducted modelling in order to estimate the percolation rate of water from the tailings site and screening mound toward groundwater. The assessment revealed that water percolation would be below the maximum daily value of 3.3 litres/square metre ( $l/m^2$ ) required by Directive 019.<sup>48</sup> The proponent has agreed to conduct additional drilling in the bedrock and sampling in the unconsolidated deposits at the location of the tailings site in order to confirm their impermeability. Additional measures to render the bottom of the tailings cells impermeable could be required by the province if the drilling reveals that the maximum daily value of  $3.3 l/m^2$  required by Directive 019 was not met.

Members of the public also raised the hypothesis that des Rapides Lake could be affected by the drawdown of the water table. The proponent estimated that the zone of influence of the dewatering of the pit on the water table would extend up to 1.6 km around the pit. No impact is anticipated on des Rapides Lake by the dewatering of the pit, the centre of which is located 6 km from the lake.

The proponent must monitor the quality of the final effluent and of the receiving environment in accordance with the requirements of the *Metal Mining Effluent Regulations*. This monitoring includes iron, aluminum, cadmium, ammonia and nitrate, which are among the substances of greatest concern considering the geochemical characteristics of the tailings. In addition to the monitoring requirements stipulated in these regulations, the proponent has agreed, at the request of the Federal Committee, to monitor phosphorus, fluorides and vanadium. These chemical elements could be present in the aquatic environment at concentrations that can cause eutrophication of the environment and be toxic to aquatic life. The Agency notes that, at the provincial level, monitoring of surface water will also be carried out in order to ensure compliance with the requirements of Directive 019 and with the other conditions imposed by the province. These conditions include in particular the imposition of a specific standard concerning levels of phosphorus and suspended solids in the mining effluent.<sup>49</sup>

The Federal Committee notes that the proponent has agreed to develop a water quality monitoring program for the water pumped from the pit as well as water quality monitoring using observation wells located between the

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<sup>48</sup> Ore, overburden, tailings and waste rock are considered leachables within the meaning of Directive 019, without however posing high risks of water contamination. They produce a leachate containing a contaminant whose concentration exceeds the applicable criteria for the protection of groundwater, but which does not exceed the criteria set out in Directive 019. Accordingly, the proponent should be able to meet the standard prescribed by Directive 019 for maximum daily percolation flow rate of  $3.3 l/m^2$  under the accumulation areas.

<sup>49</sup> The effluent must not exceed an average monthly concentration of 10 mg/L of suspended solids and 0.3 mg/L of phosphorus. Normally, the *Metal Mining Effluent Regulations* and Directive 019 do not prescribe a standard for phosphorus, and the standard for suspended solids is an average monthly concentration of 15 mg/L.

pit and the Sept-Îles Bay. This monitoring would make it possible in particular to assess the potential flow of contaminants in groundwater toward the Sept-Îles Bay and to detect the advancement of the salinity front from the bay toward the pit. The proponent has agreed to implement a specific management plan in the event of intrusion of saltwater into the pit (if the concentration of chlorides reaches the threshold of the acute water quality criterion for aquatic life, i.e. 860 mg/l). More information on the monitoring program is provided in Chapter 8.

Finally, the Federal Committee notes that the proponent will conduct annual monitoring of the level of the water table for the private surface well located at 4000 Route 138. Following discussions with the owner of the well, the proponent would establish an intervention protocol in the event that the water level of this well was affected by the Project.

### 7.3.5 *Agency conclusions on the significance of the residual environmental effects*

The planned sediment and erosion control measures will significantly reduce sediment loading in the aquatic environment. The Agency notes that the specific standard imposed by the province concerning suspended solids discharged in mining effluent is more restrictive than the standard prescribed by the *Metal Mining Effluent Regulations* and by Directive 019. This standard should make it possible to reduce metal loading of sediments downstream to levels that do not pose a high risk to the aquatic wildlife of Clet Creek and the Sept-Îles Bay.

The Agency notes that a mine wastewater collection and treatment system will be implemented. This system was designed to meet the requirements of the *Metal Mining Effluent Regulations* and of Directive 019, and to comply insofar as possible with the provincial effluent discharge environmental objectives. Taking into account the geochemical characteristics of the mine waste and the water management plan proposed by the proponent, the Agency is of the opinion that the residual effects of the Project on water quality will be low in the short and medium term. Monitoring of the effluent and of the receiving environment will make it possible to determine if effects on the aquatic environment become evident over the longer term and to take corrective action, where applicable (see Section 7.4).

Although the mining infrastructure would encroach on lakes PE-1, PE-2 and PE-3, which will be permanently lost, these losses involve small water bodies for which a fish habitat compensation plan will be developed. This plan will offset the loss of fisheries productivity that will result from the disappearance of these lakes (see Section 7.3).

Although the Project will result in a significant drawdown of the water table and saltwater intrusion is likely, the impacts on the local groundwater supply would be very limited owing to the relative distance of the project from des Rapides Lake drinking water source. According to the proponent's model, the effects of the pumping over the long term, including the drawdown of the water table and the potential of saltwater intrusion, would be reversible. However, the impact of the pumping and of the reductions in the area of watersheds could result in a significant reduction in the flows of certain watercourses during the period of operation of the mine.

The program to monitor the quantity and quality of surface water and groundwater will continue for the full duration of operation of the mining site and after closure of the mine. This monitoring program will make it possible to promptly detect any change in this valued component that could be attributable to the Project and to take corrective action, if necessary.

Taking into account the implementation of mitigation measures by the proponent, compliance with the regulations governing mining effluent and the follow-up program, the Agency concludes that the Project would not be likely to cause significant adverse environmental effects on water resources.

## 7.4 Fish and Fish Habitat

The hydrographic network of the local study area includes several small, shallow lakes and numerous small low-flow or intermittent streams, most of which flow into the Sept-Îles Bay. The surveys carried out in the streams and lakes reveal the presence of brook trout, threespine stickleback and ninespine stickleback.

Potential brook trout spawning grounds were identified downstream of streams R10 and R11 and Gamache Creek (Figure 7). The lakes appear to provide suitable feeding and nursery areas for fish. Historical data indicate that, at their mouths with Sept-Îles Bay, Hall River and des Rapides River as well as Clet Creek provide various habitats for rainbow smelt, namely a large spawning ground, a winter aggregation area and a potential spawning ground. Sept-Îles Bay supports an eelgrass bed that provides shelter for several species, including lobster, rock crab, rainbow smelt, capelin, Atlantic cod and American eel.<sup>50</sup>

No fish species at risk listed in Schedule 1 of the *Species at Risk Act* are present in the freshwater water bodies and watercourses of the local study area. Sept-Îles Bay can sometimes be frequented by the beluga (St. Lawrence Estuary population considered a threatened species), the blue whale (Atlantic population considered an endangered species) and the fin whale (Atlantic population considered a species of special concern), three marine mammals species listed under the *Species at Risk Act*.

### 7.4.1 Potential environmental effects

The destruction of lakes PE-1, PE-2 and PE-3, as well as the filling of segments of several streams and their affluents and tributaries (see Section 7.3), would cause the destruction of approximately 7.9 ha of brook trout and stickleback habitats, as well as mortality of the fish that frequent these waters.

The construction of the mining infrastructure and the application of the water management plan for the mining site (including dewatering of the pit) are likely to modify the water input regime of the lakes and watercourses and to affect fish habitat. The water level and flow of the aquatic environments in the zone of influence of the project would decrease owing to the combined decrease in their surface water and groundwater inputs. These changes would result in a reduction of the wetted area and an additional loss of fish habitat of approximately 0.6 ha in streams. In addition to these direct changes, there would also be indirect changes affecting fish habitat (changes in the water renewal rate and physicochemical conditions, and alteration of thermal refuges for fish and modification of the hydraulic conditions on the spawning grounds). Finally, the water management plan for the mining site could alter the hydraulic regime of Clet Creek and its inputs in Sept-Îles Bay.

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<sup>50</sup> Eelgrass (*Zostera marina* L.) is a common highly productive perennial aquatic plant of recognized ecological importance that can form extensive intertidal and subtidal beds in estuaries and coastal areas. It provides shelter for numerous fish and marine organisms, as well as a breeding or feeding site. Its function as a habitat structure includes providing cover from predation, reducing local current regimes, and increasing secondary productivity by adding to local habitat complexity and surface area. [Fisheries and Oceans Canada \(2009\)](#).

In the mine operation phase, the discharge of mining effluent would alter the hydraulic regime of Clet Creek by increasing its winter flow, which could reduce the ice cover which, under natural conditions, protects the eelgrass from uprooting. The mining effluent could also contribute to nutrient loading (nitrogen, phosphorus) and suspended solids loading in Sept-Îles Bay, which could have long-term effects on the eelgrass and on the aquatic resources that it shelters. The literature identifies nutrient loading, turbidity and current alteration as some of the main factors responsible for the decline of eelgrass (Fisheries and Oceans Canada, 2011).

Currently, the zone of influence of the mine effluent plume in the bay remains unknown. In addition, in the St. Lawrence maritime estuary, phosphorus appears to be a limiting factor<sup>51</sup> for the growth of toxic algae such as *Alexandrium tamarensis*, and additional inputs of phosphorus could increase the risk of algal blooms. Toxic algae can also cause the death of marine animals, and their biotoxins may be associated with paralytic shellfish poisoning (Blasco *et al.*, 2003).

All the construction work as well as the operation activities of the mine is likely to cause effects on fish habitat related to fine particulate loading. Erosion and sediment transport in the hydraulic network at the project site could alter the quality of fish habitat. It is recognized that sediment loading in the aquatic environment can cause adverse effects harmful to fish at various stages of their life cycle. Fine particulate matter can be deposited on the spawning grounds and suffocate the eggs or make the spawning grounds unsuitable for reproduction. It can also irritate the gills of fish and interfere with their movements by reducing the transparency of the water.<sup>52</sup>

Finally, blasting activities could cause fish mortality. The detonation of explosives in or near fish habitat could disturb, injure or kill fish and marine mammals or result in the harmful alteration, disruption or destruction of their habitat (Wright and Hopky, 1998).

#### 7.4.2 Mitigation measures

The proponent has agreed to institute a number of mitigation measures to reduce the adverse environmental effects on fish and fish habitat (see Appendix B). The proponent has proposed a compensation plan to offset the serious harm to fish habitat, estimated at 8.5 ha.

The proponent also undertakes to implement a series of sediment and erosion control measures in order to prevent discharges of sediments into the aquatic environment beyond the immediate work area.

The water management plan for the mining site described in Section 7.2, which provides in particular that all the contact water will be collected by drainage ditches and treated before being discharged into the environment, should make it possible to reduce the impacts on fish and fish habitat in Clet Creek and in Sept-Îles Bay, including the eelgrass bed.

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<sup>51</sup> A substance is said to be a limiting factor when plant growth depends on this element (i.e. phosphorus and nitrogen) which is available only in minimal quantity relative to the needs of these plants. The more abundant the substance, the more plant growth is stimulated. Fauchot *et al.*, 2005.

<sup>52</sup> Canadian Council of Ministers of the Environment. [Canadian Water Quality Guidelines for the Protection of Aquatic Life – Total Particulate Matter](#). Website accessed December 2014.



Finally, the blasting operations must meet the *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky, 1998).

### 7.4.3 *Government, public and Aboriginal comments and proponent's response*

Members of the Innu communities expressed concerns about the degradation of fish habitat caused by the discharge of mining effluent into Clet Creek and Sept-Îles Bay. They are concerned about the impact that this could have on traditional fishing activities and on the consumption of the fishery resources in the bay.

Despite the application of mitigation measures, the Project will cause serious harm to fish over an area of approximately 8.5 ha. This damage will be caused mainly by the encroachment of the mining infrastructure and the drainage of lakes and watercourses, which will also cause fish mortality. The habitats that will be destroyed enable brook trout, threespine stickleback and ninespine stickleback to complete their entire life cycle.

Fisheries and Oceans Canada considers that this serious harm to fish is acceptable provided that the proponent develops and implements a compensation plan that will offset the serious harm that will be caused to fish. This compensation plan will be finalized in collaboration with Fisheries and Oceans Canada and will be monitored in order to ensure that the prescribed compensation objectives are met. Depending on the monitoring results, appropriate corrective action could be taken.

The Federal Committee is concerned about the decrease in the flows of streams R10 and R11 and Gamache Creek caused by the drawdown of the water table and the reduction of their watershed, and the impacts that this could have on the brook trout spawning grounds in these streams. The proponent has agreed to add groundwater observation wells for these streams as well as control wells outside the anticipated area of drawdown of the water table. This monitoring, which will verify maintenance of the conditions (water level and flow, physicochemical characteristics) of the spawning grounds, will make it possible to determine whether serious harm to the spawning grounds could be attributable to the Project and, where applicable, to adjust the compensation plan accordingly.

Members of the public and the Innu community of Uashat mak Mani-Utenam pointed out that Sept-Îles Bay should have been considered part of the valued components in the proponent's environmental impact statement.

On this point, the Federal Committee considers that the information available in the documents provided by the proponent is not sufficient to draw any conclusions concerning the long-term effects of the discharge of mining effluent on Sept-Îles Bay, the eelgrass bed and the aquatic resources that use it. The Federal Committee is of the opinion that the effluent would contain substances that, even if they met the applicable federal and provincial standards and requirements, could present a risk of adversely affecting fish and fish habitat over the long term, and particularly the eelgrass bed located at the mouth of Clet Creek. Consequently, Fisheries and Oceans Canada will require, as part of its permit-issuing process, that the proponent model the plume from Clet Creek in Sept-Îles Bay (i.e. delimit the zone of influence of Clet Creek following the discharge of effluent) and that it characterize the initial state of the eelgrass bed in the area near the mouth of Clet Creek before any alterations to the stream (i.e. construction of the dam). In addition, the proponent must conduct long-term monitoring of the effluent and its effects on the receiving environment in this area of Sept-Îles Bay where applicable (see Chapter 8 for more details).

The Federal Committee also notes that the proponent has made an undertaking to the provincial authorities to determine the sediment accumulation zones in Clet Creek and in Sept-Îles Bay prior to the damming of Clet Creek, taking into account the loading of the mining effluent during the period of operation of the mine. The province will require a surface water and sediment monitoring program in Clet Creek and the zone of influence of this creek in the bay.

#### 7.4.4 *Agency conclusions on the significance of the residual environmental effects*

The Project will cause serious harm to fish habitat over an area of approximately 8.5 ha. However, the compensation plan to be implemented by the proponent must offset the serious harm to fish caused by the Project.

In view of the water management plan proposed by the proponent, the requirements of the *Metal Mining Effluent Regulations* and the provincial requirements, the Agency considers that the mining effluent is not likely to cause significant effects in the short and medium term on Clet Creek and Sept-Îles Bay.

The monitoring of the mining effluent and of its impact on the eelgrass bed at the mouth of Clet Creek will make it possible to determine whether effects become evident over the longer term and to take corrective actions, where applicable (e.g. improvements to the water treatment system or repositioning of the effluent discharge point).

In view of the implementation of the mitigation measures deemed relevant by the Federal Committee (Appendix B), including implementation of a fish habitat compensation plan and monitoring program, the Agency concludes that the Project would not be likely to cause significant adverse environmental effects on fish and fish habitat.

## 7.5 **Terrestrial Wildlife and their Habitat**

For the purposes of this report, the terrestrial wildlife and habitat component includes herpetofauna (reptiles and amphibians) and mammals (furbearers, small mammals,<sup>53</sup> bats and large mammals) as well as their habitats. Although all the species are considered, the Agency's analysis focuses more on the species that are harvested by the users of the area or that are considered at-risk species under the federal *Species at Risk Act* or the Quebec *Act respecting threatened or vulnerable species* (see Appendix F for more details).

The proponent documented the presence of terrestrial wildlife using existing documentary sources as well as direct observations during the various field campaigns. In addition, the proponent conducted specific surveys for herpetofauna, small mammals and bats in the summer of 2013.

The presence of numerous water bodies and wetlands in the local study area provides suitable habitat for several species of amphibians and reptiles, and the proponent's surveys and other observations confirmed the

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<sup>53</sup> All the small mammals, including rodents (voles, etc.) and insectivores (shrews, etc.). [Actu-Environnement](#). Website accessed September 2014.

presence of five of these species.<sup>54</sup> No species at risk were identified in the local study area. The density of amphibians in this area is low despite the presence of suitable habitats.

The bat survey confirmed the presence of five species of bats, three of which are likely to be designated threatened or vulnerable under the Quebec *Act respecting threatened or vulnerable species*, namely eastern red bat, hoary bat and silver-haired bat. Northern myotis and little brown myotis (*Myotis* sp.), designated as endangered by the Committee on the Status of Endangered Wildlife in Canada and recently added to the list of species listed under the *Species at Risk Act*, may also be present in the local study area.

Sixteen species of small mammals are potentially present in the local study area and the surveys confirmed the presence of five species.<sup>55</sup> Among the species confirmed, the rock vole is likely to be designated threatened or vulnerable under the Quebec *Act respecting threatened or vulnerable species*. No small mammal species at risk listed under the *Species at Risk Act* were identified in the local study area. The survey results demonstrate that the density of small mammals in this area is low.

Some 20 species of terrestrial mammals are potentially present in the local study area of the Project, most of which are furbearers highly valued for trapping, such as American beaver, river otter, American marten, weasel, muskrat, red fox and American mink. Among large mammals, only black bear and moose were observed. Moose hunting is one of the favoured activities practised by traditional users of the area.

Finally, although they were not observed by the proponent, other terrestrial wildlife species at risk could be present in the local study area, including the eastern wolf, which is designated as a species of special concern by the federal *Species at Risk Act*. This is also the case of the southern bog lemming and the least weasel, which are likely to be designated threatened or vulnerable under the Quebec *Act respecting threatened or vulnerable species*. It is unlikely that woodland caribou, which is a threatened species under the *Species at Risk Act*, frequents the local study area.<sup>56</sup>

### 7.5.1 *Potential environmental effects*

The main potential impacts on terrestrial wildlife are habitat loss and degradation, disturbance by noise and human presence, as well as increased risk of mortality.

#### *Habitat loss or degradation*

Site preparation and construction activities are expected to cause a loss of approximately 1,285 ha of potential habitats for herpetofauna and terrestrial mammals, which corresponds to 6.4 % of the local study area. The areas affected by the work will be replaced by dry, cleared areas which would fragment the current environment

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<sup>54</sup> The species identified are common and widespread in Quebec: northern spring peeper, wood frog, American toad, mink frog and blue-spotted salamander.

<sup>55</sup> The species identified are: arctic shrew, masked shrew, pygmy shrew, southern red-backed vole and rock vole.

<sup>56</sup> Although the local study area is located in the woodland caribou's geographic range, the recent occurrences took place approximately 40 km from Sept-Îles. According to Sandra Heppell, a biologist at the Department of Forests, Wildlife and Parks, it is possible that caribou may venture closer to the local study area since this area is part of the species' habitat, but this is a low-quality habitat given the level of disturbance. The probabilities of use decrease with greater proximity to Sept-Îles.

and could constitute a physical barrier to the dispersion of amphibians. The presence of physical barriers could restrict movement and result in the decline of populations at certain sites.

Table 5 presents an estimate of habitat losses in hectares for certain species of mammals valued by users of the area or that are considered at risk.

**Table 5 Estimate of habitat losses for certain species of mammals**

Species	Home range <sup>57</sup>	Habitats on the mine property that may be frequented by the species	Habitat losses (construction and operation) (ha)
Small mammal			
Rock vole	-	Coniferous <sup>58</sup> and mixed <sup>59</sup> forest	1,196
Bats			
Silver-haired bat	-	Coniferous and mixed forest; lakes and water bodies; dry, cleared areas, anthropogenic	1,285
Eastern red bat	-	Coniferous and mixed forest; lakes and water bodies; dry, cleared areas, anthropogenic	1,285
Hoary bat	-	Coniferous and mixed forest; lakes and water bodies; dry, cleared areas, anthropogenic	1,285
Northern myotis and little brown myotis ( <i>Myotis</i> sp.)	-	Mature forests, watercourses, water bodies and wetlands	127.3
Furbearers			
Least weasel	1 ha	Wetlands; cleared areas, anthropogenic	29
American marten	2 to 3 km <sup>2</sup> (male) 0.8 km <sup>2</sup> (female)	Coniferous and mixed forest	1,196
Eastern wolf	39 to 13,000 km <sup>2</sup>	Coniferous and mixed forest; wetlands; dry, cleared areas and anthropogenic	1,279
American beaver	2.6 to 5.2 km <sup>2</sup>	Swamps; lakes and water bodies	11
River otter	-	Swamps; lakes and water bodies	11
Small wildlife			
Snowshoe hare	2 to 16 ha	Coniferous and mixed forest; dry, cleared areas, anthropogenic; swamps	1,205
Large wildlife			
Moose	5 to 10 km <sup>2</sup>	Mixed forest; swamps; cleared areas, anthropogenic; lakes and water bodies	177
Black bear	60 to 173 km <sup>2</sup> (male) 5 to 50 km <sup>2</sup> (female)	Coniferous and mixed forest; wetlands; dry, cleared areas and anthropogenic	1,279

<sup>57</sup> Home range is the area where an animal ordinarily lives and that is sufficient to meet its primary needs.

<sup>58</sup> Specifically, open and closed spruce stands and closed balsam fir stand.

<sup>59</sup> Specifically, balsam fir-white birch stand.

The species of mammals that would be most affected by habitat losses are those that frequent the coniferous forest, such as American marten, snowshoe hare, eastern wolf, black bear, rock vole, silver-haired bat, eastern red bat and hoary bat.

Most of these species could be adversely impacted by disturbance, but will have the ability to move to similar habitats which are abundant nearby. Habitat loss and fragmentation would restrict movements and could result in the decline of populations of certain less mobile species of mammals, such as rock vole, which may be present on the mining site.

In the proponent's opinion, the local study area does not constitute a particularly favourable breeding habitat for bats. These animals regularly travel through the area to reach more suitable habitats which would not be affected by the Project (e.g. the wetlands located on the eastern shore of Hall River and the cliffs that run along the north shore of Hall Lake). The proponent considers that approximately 220 ha used as bat travel corridors would be temporarily disturbed during mine site preparation and mine operation. The losses of vegetation and watercourses in these corridors would reduce the attractiveness of the site for food, rest and breeding. However, the proponent suggests that these corridors would probably still be used for travel between higher quality habitats, while being more used at night and/or during periods of reduced activities. It should be noted that no hibernation sites have been identified in the local study area.

Moose would lose 14% of their preferred habitats currently present in the local study area. These habitats include mixed forest, swamps and water bodies. According to the proponent, similar habitats are available in the periphery of the Project area and further north in the Matimek controlled harvesting zone. Any individuals that might lose their territory could move to those sites.

#### *Disturbance by noise and human presence*

Various construction activities as well as the movement of machinery, blasting and crushing will constitute sources of noise. This noise could interfere with the breeding call of the anuran amphibians that live in the water bodies and wetlands located near the project infrastructure, and thus affect their breeding. Among mammals, feeding, breeding and rearing behaviour could be disturbed, depending on the period when the work takes place. The effects of the disturbance would be felt mainly by the species that have small home ranges, such as small mammals and amphibians, American marten, red squirrel and snowshoe hare.

#### *Risk of mortality*

Clearing, soil stripping and cutting and filling activities are likely to cause the mortality of individuals of terrestrial wildlife during site preparation. The mortality will mainly affect low-mobility species as well as those associated with trees like the red squirrel and the American marten. Vehicle traffic on the access roads and the transport of concentrate by rail could also cause mammal mortality.

### **7.5.2 Mitigation measures**

In order to minimize the adverse effects of the Project on terrestrial wildlife, the proponent has agreed to implement various mitigation measures (see Appendix B), several of which are intended to reduce habitat loss. For example, the proponent has agreed to limit clearing exclusively to the areas necessary for future operations, and to clearly delimit the work areas as well as the travel and movement corridors for workers and machinery. The proponent also undertakes to quickly and progressively stabilize, revegetate and reforest the areas



temporarily disturbed by the work. In addition, the proponent has agreed to develop and implement a wetland compensation plan, which would further reduce the impacts on the terrestrial wildlife using these environments. The proponent has agreed to install shelterbelts and to leave certain forest corridors intact to permit the free movement of bats on the mining site.

In order to mitigate the effects related to the risks of collisions with vehicles, the proponent will take various steps, including limiting the speed of vehicles and trucks on the mining site to between 20 and 50 km/h, depending on the location. Finally, the steps taken to mitigate the effects of noise and vibrations on human health, which are described in Appendix B, will also have the effect of mitigating the disturbance of terrestrial wildlife.

### *7.5.3 Government, public and Aboriginal comments and proponent's response*

The Innu Nations of Uashat mak Mani-Utenam and Matimekush-Lac John expressed concerns about the potential impact of the Project on small and large mammals (e.g. porcupine, snowshoe hare, moose and woodland caribou), as well as on furbearers.

The Federal Committee noted the lack of exhaustive surveys on terrestrial wildlife and asked the proponent to conduct specific studies on amphibians and reptiles, small mammals and bats. The proponent conducted surveys specific to these three groups of vertebrates in the summer of 2013. In the case of bats, the recent massive mortalities in eastern North America justify clearly documenting the presence of these species in the local study area.<sup>60</sup>

The Federal Committee expressed concerns about the impact of vibrations and noise on the populations of Northern Myotis and Little Brown Myotis, and in particular on hibernating colonies and maternity roosts. The proponent points out that no maternity roosts or hibernacula are present on the project site, which reduces the risk of this type of impact. In the event that bat maternity roosts are discovered, the proponent has agreed to minimize the work in the immediate area during the breeding period, i.e. between the months of June and August. In addition, the proponent has agreed to create maternity roosts in undisturbed adjacent areas, in the event of the destruction of natural maternity roosts present on the mine site. Finally, in response to a request from the province, the proponent has agreed to conduct monitoring of the disturbed area in order to measure the impact of the mining activities on bats throughout the lifetime of the mine.

### *7.5.4 Agency conclusions in the significance of the residual environmental effects*

The Agency notes that approximately 87% of the 1,285 ha of potential terrestrial wildlife habitats which would be lost will be progressively restored, which will minimize the duration of the effect of the habitat losses. Given the availability of similar habitats for several species around the perimeter of the local study area, the mobility of the majority of the species, the application of the mitigation measures, the mining site restoration plan and the wetland compensation plan, the Agency considers that the survival of the populations of mammals and

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<sup>60</sup> [Department of Forests, Wildlife and Parks](#). Massive bat mortalities have been observed since 2006 owing to white-nose syndrome, a fungal infection that is decimating the populations of cave-dwelling bats in the eastern part of the continent, including Quebec. Website accessed November 2014.

herpetofauna is not threatened by the implementation of the project and the associated habitat losses. In the case of low-mobility species such as rock vole, the Agency considers that the project could result in the loss of a few individuals, without however compromising the integrity of the species in the local study area.

The Agency also recognizes that the noise generated is likely to inconvenience terrestrial wildlife and that the feeding, breeding and rearing behaviour of certain species could be disturbed. Given the application of the mitigation measures and the limited radius of the impact zone, the Agency considers that only a small number of individuals would be affected. The Agency considers that the impact of noise disturbance on terrestrial wildlife would be low.

Similarly, the Agency is of the opinion that mortality due to collisions with vehicles would be limited to roadways and to a few individuals, which will not noticeably affect the integrity of terrestrial wildlife at the scale of the local study area.

Taking into account the mitigation measures that the proponent has committed to implement, the Agency concludes that the Project would not be likely to cause significant adverse environmental effects on terrestrial wildlife and their habitats.

## 7.6 Birds and Bird Habitat

This component includes landbirds and waterbirds (including waterfowl<sup>61</sup>) as well as their habitats, namely forests, wetlands and open environments as well as water bodies.

According to the various sources consulted,<sup>62,63</sup> the local study area is likely to be frequented by nearly 200 bird species on an annual basis. The surveys conducted by the proponent in 2011 and in 2012 confirmed the presence of 92 species, the majority of which are migratory and protected under the *Migratory Birds Convention Act, 1994* (see Appendix F for more details).

The surveys identified nine breeding species of waterfowl, including Canada goose, mallard, American black duck and ring-necked duck. Several other waterbird species were also identified, including great black-backed gull, double-crested cormorant, sandpiper, great blue heron and kingfisher.

Fifty-eight species of landbirds were identified and the habitats most frequently used by these species are coniferous forests (spruce stands and balsam fir stands). The proponent estimated that the total population of landbirds breeding in the local study area is between 15,236 and 39,494 breeding pairs. The proponent counted six species of birds of prey during the breeding period, namely osprey, red-tailed hawk, American kestrel, merlin, peregrine falcon and great horned owl. Five osprey nests were also observed.

Potential breeding habitats were identified for four species at risk listed under the *Species at Risk Act*: Canada warbler, rusty blackbird, common nighthawk and olive-sided flycatcher. Only the last two species were observed

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<sup>61</sup> Specifically ducks, geese and swans. [The Canadian Encyclopedia](#). Website accessed September 2014.

<sup>62</sup> Computerized Database of Quebec Seabirds, (Canadian Wildlife Service, Environment Canada).

<sup>63</sup> Aerial surveys of waterfowl gathering areas of the North Shore, 1991-1992 and 1999 (Brault *et al.*, 1998; Normand, 2003).

in the local study area during the breeding bird surveys. Barrow’s goldeneye, a species of special concern which is also listed in Schedule 1 of the *Species at Risk Act*, is present in Sept-Îles Bay during the migration period. The proponent observed its presence mainly in November and from April to June.

### 7.6.1 Potential environmental effects

The activities related to the construction, operation and closure of the mining site could have negative impacts on bird fauna, particularly through habitat loss and degradation, noise disturbance and increased risk of mortality. These impacts are mainly related to clearing, excavation and blasting work, movement of machinery and the daily activities of the mine operation.

#### *Habitat loss and degradation*

According to the proponent, the Project would cause a total loss of 1,285 ha of habitat for bird fauna, including approximately 24 ha of wetlands.<sup>64</sup> Table 6 presents the losses by habitat type and provides an overview of their magnitude at the scale of the local study area.

**Table 6 Projected habitat losses for the Arnaud project**

Habitat type	Total losses in hectares (ha)	Abundance of the habitat in the local study area (ha)	% of losses in the local study area
Closed spruce stand	244.7	1,645.3	15
Open spruce stand	554.9	1,821.5	31
Closed balsam fir stand	234.4	1,586.5	15
Forested peat bog	17.4	286.6	6
Open peatland	1	ND*	ND
Shrub swamp	5.7	149.2	3
Mixed forest (balsam fir-white birch stand)	163	ND	ND
Water bodies	6.4	ND	ND
Other	57.9	ND	ND
<b>Total</b>	<b>1,285.4</b>		

\*ND: not determined

The losses of nesting and foraging habitat will have an impact by disturbing the breeding pairs, which will have to relocate to similar habitats nearby. When similar habitats become scarcer, this can result in an increase in the density of birds in the same habitat and lead to a shortage of resources and an increase in predation. Generally,

<sup>64</sup> Include ponds, marshes, swamps and peatlands.

habitat destruction and degradation contribute directly or indirectly to the decline of certain more vulnerable species.<sup>65</sup>

The habitats affected or destroyed by the Project are not particularly scarce in the regional landscape and do not have particular characteristics that would make them highly valued habitats. For example, the wetlands affected are for most part small in area and far apart, which makes them unattractive to birds which use this type of habitat. In addition, the main types of habitat most affected by the project and most predominant in the local study area (open spruce stand, closed spruce stand and closed balsam fir stand) are also very frequent outside the local study area and at the regional scale.

Based on the densities of birds observed in the field during the surveys in the various habitats, the proponent produced an estimate of the number of breeding pairs that could be affected by habitat loss and alteration.

Approximately 1,100 breeding pairs of landbirds could be affected by the loss of habitat during the construction and operation phases of the Project. As Table 6 indicates, approximately one third of the habitats in open spruce stands will be lost in the Project local study area. According to the surveys conducted, this habitat is frequented by 27 species, the most abundant of which are: white-throated sparrow, dark-eyed junco, Nashville warbler and ruby-crowned kinglet. The proponent indicates that approximately 85 % of the breeding pairs affected by habitat loss during the construction and operation phases may breed again in the restored areas once these habitats have attained their full maturity.

For waterbird species, the losses of wetlands and water bodies could affect six breeding pairs of mallard, green-winged teal and ring-necked duck.

The mining project could also affect 11 pairs of birds of prey and would result in the loss of an osprey nest located in the area where the screening mound will be constructed.

Suitable habitat for the olive-sided flycatcher (species at risk) in the local study area is located in swamps and peatlands. The anticipated losses in these two types of habitat are 24 ha. Assuming that the size of the territory of a breeding pair ranges from 10 to 20 ha, only one or two pairs are likely to be affected by the Project.

Suitable habitat for the common nighthawk (species at risk) is composed of open areas with little or no ground vegetation, such as logged or burned-over areas, cleared areas, waste rock piles, peatlands, lake edges and mine waste storage areas. Although certain habitats consisting of very open spruce stands will be lost progressively in the operation phase, which may affect up to four breeding pairs, these losses will be offset by the progressive restoration of the spruce stands in the tailings cells. The proponent considers that the balance sheet for this species will be positive in the medium term owing to a net gain of habitat, related to revegetation efforts during the progressive restoration of the site, which will begin in the second year of operation of the Project.

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<sup>65</sup> Environment Canada. 1997. [Guide for impact assessment on birds](#). Website accessed September 2014.

### *Other potential effects on bird fauna*

In addition to habitat loss, birds' nests could be destroyed during the construction phase, particularly by the cutting of trees and other vegetation as well as by overburden removal.

The various activities that will generate noise and vibrations (see Section 7.2.1) could constitute a source of disturbance for bird fauna. In general, there is a negative relationship between the type and magnitude of disturbance experienced by a nesting bird and its breeding success. For example, disturbed birds tend to spend more time off the nest, which could increase the likelihood of predation of eggs or nestlings, exposure of nest and eggs to cold temperatures or wet conditions, fewer episodes of chick feeding, premature fledging or abandonment of nestlings and physiological stress.<sup>66</sup>

The settling basin would receive all the water captured on the mine site and could contain deleterious substances. It could prove attractive to and be used by waterbirds. The proponent considers it unlikely that the basin will be used for breeding/nesting owing to the lack of vegetation and lack of sufficient and suitable food in the vicinity of the basin. Use of this basin would therefore be of short duration, reducing the duration of exposure to any contaminants present. The proponent also points out that the operation of an apatite mine requires the use of only a few chemical compounds (see Section 4.2), which are biodegradable and relatively diluted once in the settling basin.

### *7.6.2 Mitigation measures*

The proponent has agreed to implement various mitigation measures (see Appendix B) to reduce the adverse environmental effects on birds and bird habitat.

Several design features were included from the beginning in the development of the Project in order to prevent and minimize habitat loss and degradation. For example, the progressive restoration of the tailings cells in the operation phase would result in re-establishment of vegetation and gradual re-use of this area by bird fauna. In addition, the proponent has agreed to develop and implement a wetland compensation plan, which would further reduce the impacts on birds using these wetlands.

In order to reduce the risks of destruction of birds' nests and breeding disturbance, the proponent has agreed, for example, to conduct clearing and grubbing outside the key nesting period, which in this area extends from May 1 to August 15. The steps taken to mitigate the effects of noise and vibrations on human health, which are described in Section 7.2.2 and in Appendix B, would also have the effect of mitigating the disturbance of bird fauna.

Finally, the proponent has agreed to pay particular attention to the bird fauna that could potentially use the settling basin and, where appropriate, to use recognized bird scaring equipment.

### *7.6.3 Government, public and Aboriginal comments and proponent's response*

Environment Canada asked the proponent to improve its analysis of the effects of the Project on the common nighthawk and the olive-sided flycatcher, specifically by assessing habitat loss and alteration, as well as the

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<sup>66</sup> Environment Canada. [Technical Information: Risk factors for migratory birds](#). Website accessed September 2014.

number of breeding pairs potentially affected. In addition, following a recommendation by Environment Canada, the proponent has agreed to include a bird fauna component in the environmental monitoring program. The goal of this program will be to protect migratory birds, particularly those with species-at-risk status, which may be present within the mining site. This program will include measures in order to avoid harming or disturbing birds, their nests or eggs and will include the establishment of a buffer zone around any nests that may be discovered.

Environment Canada considers that some uncertainty remains concerning the impact of the use of the settling basin by bird fauna. Vegetable oil, which is used in the flotation process, may be present in the basin and could result in effects on the birds that might use this basin and that would spend more time cleaning their feathers, making them more vulnerable to predation. In order to prevent migratory birds from coming into contact with deleterious substances present in this basin, the proponent must comply with section 5.1 of the *Migratory Birds Convention Act, 1994*. The proponent has agreed to implement mitigation measures in order to comply with this act (see Appendices B and F for more details).

#### 7.6.4 Agency conclusions on the significance of the residual environmental effects

Owing to the wide availability of similar habitats in the region where the Project is located, it is highly probable that the bird populations affected by the anticipated habitat losses will be successful in relocating elsewhere.

Concerning the species at risk present on the mining site (olive-sided flycatcher and common nighthawk), only a few pairs may be adversely impacted by the disturbance associated with habitat loss. In addition, the plan for progressive restoration of the tailings cells, the wetland compensation plan developed by the proponent and the restoration of the site after closure will minimize the duration of the effects on these species and could even promote the creation of habitat in the medium term in the case of the common nighthawk.

The Agency is also of the opinion that implementation of the mitigation measures should significantly reduce the destruction of birds' nests as well as the disturbance of bird fauna caused by the noise associated with mine construction and operation. If necessary, the use of bird scaring measures should be effective in preventing birds from being contaminated by the water in the settling basin.

Taking into account the mitigation measures that the proponent has committed to implement, the Agency concludes that the Project would not be likely to cause significant adverse environmental effects on birds and bird habitat.

## 7.7 Current Use of Lands and Resources for Traditional Purposes

This section deals with the effects of the Project on the current use of lands and resources for traditional purposes by Aboriginals as well as any structure, site or thing that is of historical, archeological, paleontological or architectural significance.

The current use of lands and resources for traditional purposes takes into account the practices or activities that are part of the distinctive culture of the Aboriginal group and that were commonly practised by this group over a period extending from the recent past to the present. Current use of lands and resource for traditional purposes includes in particular hunting, fishing, trapping, berry-picking, cultural and other traditional uses of the land (e.g. gathering of medicinal plants, use of sacred sites).



In order to assess the effects of the Project on this valued component, the Agency took into account the documentation from its own consultations conducted during the federal environmental assessment process, the documentation provided by the proponent in the preparation of its environmental impact statement, as well as the documentation made public during the environmental assessment conducted by the province. Although the analysis of the effects focuses on the local study area, the analysis also takes into account the regional study area, particularly in terms of the availability of the habitats of the various wildlife resources.

Three traplines are present in the local study area and are assigned to non-native trappers by the Quebec Department of Forests, Wildlife and Parks. These trappers have exclusive trapping rights, but the other users of the area can practise other traditional activities there, such as hunting, fishing and gathering.

The Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John report that traditional activities are practised regularly on the territory that they claim (Nitassinan). These activities include hunting of migratory birds, small game, moose, woodland caribou and furbearers, fishing for brook trout, capelin, lobster, cod, flounder and lake whitefish, beaver trapping, wild berry-picking, use of the forest and other plants (e.g. as medicinal plants), and spiritual activities. This claimed territory (Nitassinan) includes Sept-Îles Bay, des Rapides River, au Foin River, du Poste River and Sainte-Marguerite River, which are areas valued by these Aboriginal groups.

Nitassinan also includes the Project local study area, where the impacts of the Project would be felt. The portion of the local study area that would be directly affected by the mining infrastructure appears to be used infrequently or not at all by the Innu, who have no permanent facilities or structures there.<sup>67</sup> No trapline or family lot belonging to a member of the community of Uashat mak Mani-Utenam is present in this area. Only berry-picking was mentioned as a traditional activity that may be practised there.

However, Sept-Îles Bay is part of the local study area and is reportedly a valued area where several of the traditional activities mentioned earlier are practised. The coastline of the bay, more specifically the section between Hall River and des Rapides River, is close to the mining site where various traditional activities are reportedly practised, such as small game and waterfowl hunting, trapping, gathering and other uses of the forest and plants.

In Quebec, cultural property, including archeological sites, is protected by the Quebec *Cultural Property Act* (see Appendix F for more details). Some work aimed at identifying the archeological potential of the coastline and inland areas of the Sept-Îles region has been carried out in the past, but did not reveal any Aboriginal archeological sites in the Project local study area. According to the proponent, the most significant zones of potential Aboriginal occupation are located around the mouths of the main watercourses that flow into Sept-Îles

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<sup>67</sup> This statement is based mainly on information provided by the proponent, who relied on a review of the literature in which the most recent data dates back to 2006 for linear projects that concern the Project regional study area, on consultations that the proponent conducted with the community, and on discussions with a non-native trapper who has been using the local study area for approximately 50 years. This statement also takes into account the information provided by the community during the consultations conducted by the federal government as well as the information made public during the environmental assessment conducted by the province.

Bay. In total, the proponent identified 41 zones of Aboriginal archeological potential within the boundaries or in the immediate vicinity of the local study area.<sup>68</sup>

### 7.7.1 *Potential environmental effects*

Construction of the mine infrastructure will result in loss of use of the territory for traditional purposes. According to estimates produced based on the assumption of a 500-metre buffer zone around the mining facilities, an area equivalent to 2,638.8 ha (26.38 km<sup>2</sup>) will no longer be available to be used for traditional purposes during the construction and operation phases of the mine. Following complete restoration of the mining site, an area of approximately 167 ha, corresponding to the portion of the pit that will be flooded, will be permanently unavailable to be used for traditional purposes.

The activities associated with both the construction and operation of the mine could indirectly cause a reduction in the quality of wildlife harvesting activities in the areas adjacent to the work zone (e.g. the coastline of the bay), but not directly affected by the work. In fact, noise, vibrations and human presence could result in the displacement of the wildlife resources of interest to other parts of the area. Generally, the resulting disturbances could hinder the practice of traditional activities on the coastline of Sept-Îles Bay. According to the modelling carried out by the proponent, noise levels would be highest along the 2 to 3 km section of the coastline located across from the pit. This noise would be generated during the construction phase and at the beginning of operations, i.e. until the screening mound is completed (fifth year of the operation phase).

In addition, potential impacts on water quality as well as on atmospheric emissions (see Sections 7.2.1 and 7.3.1) could result in contamination of fruits and other plants gathered for consumption and contamination of the flesh of waterfowl and fish, including in the Sept-Îles Bay. This potential contamination could reduce the quality of the fruits and of the meat and fish consumed by the Innu, contribute to changes in their eating habits, and even result in health problems if this flesh is consumed. However, the atmospheric modelling for total suspended particulates predicts, for the worst-case scenario, concentrations on the order of 10 to 40 micrograms/cubic metre (µg/m<sup>3</sup>) in the ambient air on the coastline of Sept-Îles Bay, between Hall River and the des Rapides River, during operation of the mine. These concentrations are below the standard of 120 µg/m<sup>3</sup> prescribed by the *Clean Air Regulation*. The proponent also plans to implement a water management and treatment system which will ensure that all water from the mining site will be collected and treated before being discharged into Clet Creek. The effluent must meet the criteria prescribed by the *Metal Mining Effluent Regulations* and Directive 019.

Finally, the mine construction activities could result in the disturbance of a potential zone of Aboriginal occupation, resulting in the loss of significant elements of archeological heritage. Indeed, the overburden accumulation area overlaps a zone of Aboriginal archeological potential which extends along the axis of an unnamed stream that flows from the east of the future pit toward the coastline.

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<sup>68</sup> This statement by the proponent is based on a study of archeological potential dealing with Aboriginal and Euro-Canadian occupation prepared by Jean-Yves Pinal (2011), senior consulting archeologist.

### 7.7.2 *Mitigation measures*

The mitigation measures that concern the other valued components discussed in this report (see Appendix B) will also help mitigate the effects of the project on the current use of lands and resources for traditional purposes. For example, restoration of the mining site will ensure that the great majority of the losses of territory in the local study area will be reversible. The water management measures and dust management plan will reduce the risks of contamination of the flesh of the various wildlife resources. The measures concerning the acoustic environment will considerably reduce the magnitude and extent of the disturbance caused by noise and vibrations. The proponent has also developed a fish habitat compensation plan which will significantly reduce the impacts of the project on fish and fish habitat as well as on traditional fishing.

Before commencement of the work, the proponent has agreed to conduct an exhaustive archeological survey of the zone of Aboriginal archeological potential in the vicinity of the R6 creek near the future screening mound. The objective of this survey will be to verify the presence or lack of archeological sites in this area. If other sites are discovered, various actions and temporary protection measures will be applied in accordance with the Quebec *Cultural Property Act*. For example, the site supervisor must be informed immediately of the discovery and must take the necessary actions to protect the site without delay.

### 7.7.3 *Government, public and Aboriginal comments and proponent's response*

The Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John are concerned about the impacts that the project could have on the practice of their traditional activities, particularly in Sept-Îles Bay, a valued area where hunting, fishing and gathering activities are practised, and where several camp sites are located.

Uashat mak Mani-Utenam and Matimekush-Lac John raised concerns about the area along the coastline of the bay, i.e. the section between Hall River and the Rivière des Rapides to the south of the mining site. The communities pointed out that this area is an important traditional hunting area for migratory birds and small game and are concerned about the possibility of contamination of the flesh of the animals hunted. Considering the modelling of the dispersion of atmospheric emissions carried out by the proponent, the location of the sites used by waterfowl and small game, as well as the transient presence of migratory bird species at these sites, the Agency considers that the impact of dust on these species is low and that contamination of their flesh is unlikely.

The Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John expressed concerns about the impact of blasting on the waterbirds that frequent the Sept-Îles Bay and surrounding areas. They are concerned about the impact that this could have on traditional hunting activities. Although there would be daily blasting in the pit throughout the operation of the mine, the Federal Committee considers that waterbirds will not suffer any significant impacts given the distance of the mine site from the bay and the sites of interest. In addition, the proponent will build a screening mound and will implement several other measures to mitigate the impacts of the project on air quality, the acoustic environment and vibrations.

The Agency notes that the proponent has established a project consultation and monitoring committee. A member of the community of Uashat mak Mani-Utenam will participate in the work of this committee, which would have the authority to make recommendations for the entire project life cycle.

#### 7.7.4 *Agency conclusions on the significance of the residual environmental effects*

The Agency considers that there will be residual environmental effects, owing in particular to temporary and permanent losses of lands used for traditional purposes in the portion of the local study area affected by the mining infrastructure. The great majority of the areas lost will be restored and only 167 ha will be permanently lost. According to the information brought to the attention of the Agency during the environmental assessment of the project, this area appears to be infrequently used by the Innu community. The Agency is of the opinion that these losses of use of the territory will not compromise the current use of the lands for traditional purposes and will have a minor impact on the continuity of the way of life of the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John.

The Agency considers that disturbance of the acoustic environment could inconvenience users of the area in the practice of certain traditional activities (e.g. hunting of small game and waterfowl). However, the Agency notes that this disturbance would be limited in space (2 to 3 km section along the coastline of Sept-Îles Bay) and in time, i.e. until construction of the screening mound is completed (fifth year of the operation phase).

With the exception of the effects related to disturbance of the acoustic environment, the Agency considers that the impacts of the project on the coastline of Sept-Îles Bay and on the bay itself will be low and should therefore not hinder the practice of traditional activities by the Innu communities. In fact, this area would not be directly affected by the mining facilities and, consequently, no direct loss of use of the territory and no loss of wildlife habitat are anticipated. In addition, the Agency considers that the atmospheric emissions will be low in this sector. The low level of dust deposition at this location should not cause contamination of berries or of the flesh of wildlife resources, and therefore should not hinder the hunting and gathering activities carried out in this area. In view of the water management and treatment plan proposed by the proponent, as well as the anticipated nature of the mining effluent, the Agency considers that the discharges into water bodies and watercourses will not contaminate the flesh of fishery resources. In addition, the Agency considers that the monitoring of air quality, the acoustic environment, surface water and groundwater will ensure that the effects are as predicted and will allow additional mitigation measures to be implemented in the event that unforeseen adverse environmental effects occur.

In view of the planned mitigation measures, no impact is anticipated on archeological heritage.

In view of the mitigation measures that will be implemented by the proponent and the participation of a member of the community of Uashat mak Mani-Utenam in the consultation and monitoring committee, the Agency concludes that the project is not likely to cause significant adverse environmental effects on the current use of lands and resources for traditional purposes or on any structure, site or thing that is of historical, archeological, paleontological or architectural significance.

## 7.8 **Cumulative Environmental Effects**

Cumulative environmental effects are defined as the effects on the environment that are likely to result from a project when a residual effect combines with the effects of other projects or human activities that have been or will be carried out. This assessment of cumulative effects is based on the proponent's analyses and the Agency's Operational Policy Statement on cumulative effects (Canadian Environmental Assessment Agency, 2007). The purpose of the cumulative effects assessment is to determine the extent to which the residual environmental

effects of the Arnaud project on a valued component will combine with the effects of other physical activities that have been or will be carried out.

The methodological approach applied by the proponent for the assessment of cumulative effects includes the following steps:

- determination of the scope of the study, including the identification, based on regional concerns, of the valued components and their spatial and temporal boundaries;
- description of past, present or future actions, projects or events that have or will have a probable interaction with one of the valued components;
- analysis of the potential cumulative effects affecting the valued components by determining, for each, the reference state, historical trends and cumulative effects;
- development of cumulative effects mitigation measures.

### 7.8.1 *Scope*

The valued components were chosen based on the residual effects of the project, their potential for interaction with other projects, actions or events, as well as the concerns expressed by local stakeholders and residents. Three valued components were chosen for analysis of the cumulative effects of the project, namely air quality, moose and species at risk.<sup>69</sup>

#### *Spatial boundaries*

The proponent determined that the spatial boundaries of the analysis of cumulative effects on air quality correspond to the area of the Sept-Îles municipality, including the community of Uashat. The proponent took into account the fact that the dispersion of the atmospheric contaminants identified would be concentrated in an area of approximately 5 km around the main emission sites.

For the analysis of cumulative effects on moose, the study area is larger owing to the mobility of this species and the vast size of the hunting grounds used. Given the fact that the project is located almost entirely within the Matimek controlled harvesting zone and that moose hunting is controlled in this zone, the boundaries of this zone were chosen as a relevant study area to assess the cumulative effects.

The study area considered for the cumulative effects on species at risk includes Sept-Îles Bay and the Matimek controlled harvesting zone and extends eastward as far as Havre-Saint-Pierre in order to include the La Romaine project.

#### *Temporal boundaries*

From a temporal standpoint, the first study on air quality in the region dates from 1975. This date was therefore chosen as the starting point of the analysis of this component. For moose, the period chosen begins in 1988, the date of the first aerial survey carried out on the North Shore. The temporal boundary of the cumulative impacts

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<sup>69</sup> The proponent also assessed the cumulative effects related to housing and traffic. These valued components are not addressed in the present comprehensive study report since they do not fall within the definition of “environmental effects” of the former Act.

on species at risk begins in 1970 for migratory birds and in 2002 for bats. These periods correspond, respectively, to the first Environment Canada breeding bird survey and the first bat surveys conducted on the North Shore by the Réseau québécois d'inventaire acoustique de chauves-souris.

All the periods of analysis for the consideration of future projects were limited to approximately 10 years following the start of project operations, owing to the uncertain nature of the implementation of projects or actions in the future. The periods covered therefore extend until 2025.

The physical activities that have been or will be carried out that were taken into account in the cumulative effects analysis are presented below.



**Table 7 Physical activities taken into account in the cumulative effects analysis**

Project / Activity	Past	Ongoing	Future	Effect on the valued component
Quebec North Shore and Labrador Railway (1954) Arnaud Railway (1959)	X	X	X	<b>Air quality:</b> Increase in atmospheric emissions caused by the more frequent passage of trains
Infrastructure and activities at the Port of Sept-Îles	X	X	X	<b>Air quality:</b> Increase in emissions of atmospheric pollutants related to shipping and traffic associated with the vehicles of employees working in the Port of Sept-Îles area
Construction of the Alouette aluminum smelter in Pointe-Noire (1992), expansion of the smelter (2005) and planned development of phase 3 (timetable to be determined)	X	X	X	<b>Air quality:</b> Emissions of total suspended particulate matter and fine particulate matter into the atmosphere
Pellet plant operated by the Iron Ore Company and dismantling of the plant in 2012; ore storage and transshipment activities in the port	X	X	X	<b>Air quality:</b> Emissions of total suspended particulate matter and fine particulate matter into the atmosphere
Imperial Oil	X	X	X	<b>Air quality:</b> Emissions of volatile organic compounds
Pellet plant operated by Cliffs Natural Resources (formerly Wabush Mines)	X			<b>Air quality:</b> Emissions of total suspended particulate matter and fine particulate matter into the atmosphere
Development of infrastructure for handling iron concentrate at the Port of Sept-Îles, Bloom Lake mining project	X			<b>Air quality:</b> Emissions of total suspended particulate matter and fine particulate matter into the atmosphere
Storage of iron concentrate and loading facilities in Pointe-Noire, Kami mining project, Alderon Iron Ore Corporation			X	<b>Air quality:</b> Emissions of total suspended particulate matter and fine particulate matter into the atmosphere
Logging operations by holders of forest management and supply contracts (logging and logging roads)	X	X	X	<b>Moose:</b> Habitat disturbance and loss in the short term; creation of regenerating environments composed of deciduous trees (habitats favourable to moose) in the medium term; access to the area and increase in hunting pressure  <b>Species at risk:</b> Losses and creation of habitats for olive-sided flycatcher and common nighthawk; habitat losses for bats of the genus <i>Myotis</i>
Impoundment of the Sainte-Marguerite reservoir	X			<b>Moose:</b> Habitat disturbance and loss in the watershed of the Sainte-Marguerite River  <b>Species at risk:</b> Habitat losses for olive-sided flycatcher, common nighthawk and bats of the genus <i>Myotis</i>

Project / Activity	Past	Ongoing	Future	Effect on the valued component
Snowmobile and quad trails	X	X	X	<b>Moose:</b> Access to the area and increase in hunting pressure
Matimek controlled harvesting zone (1979)	X	X	X	<b>Moose:</b> Access to the area and increase in hunting pressure
Construction of power transmission lines (two rights-of-way, totalling six lines) that cross the mining site	X			<b>Moose:</b> Habitat alteration during clearing; creation of regenerating environments composed of deciduous trees (habitats favourable to moose); access to the area and increase in hunting pressure
Connection of the La Romaine-1 and La Romaine-2 generating stations to the Arnaud substation (2012-2013)			X	<b>Moose:</b> Habitat alteration during clearing; creation of regenerating environments composed of deciduous trees (habitats favourable to moose); access to the area and increase in hunting pressure.  <b>Species at risk:</b> Habitat alteration and losses during clearing; creation of regenerating environments composed of deciduous trees and barren areas with rocky outcrops (favourable habitat for common nighthawk)
La Romaine hydroelectric project		X	X	<b>Species at risk:</b> Habitat losses for olive-sided flycatcher, common nighthawk and bats of the genus <i>Myotis</i>

## 7.8.2 Potential cumulative effects

### *Air quality*

According to the air quality assessment campaign conducted in downtown Sept-Îles between June 2012 and June 2013, the air quality measured in Sept-Îles is the best of all the stations of the Quebec air quality monitoring network.

The main sources of effects on air quality in the town of Sept-Îles are related to industrial activities, and particularly to the presence of ore storage and transshipment facilities and the Alouette aluminum smelter in Pointe-Noire. These industries emit particulates into the air which are then dispersed by the wind. Certain projects, such as the construction of infrastructure for handling iron concentrate in the Port of Sept-Îles, may increase these emissions. In addition to industrial activities, the impact of the emissions of pollutant gases associated with the anticipated increase in traffic on Route 138 and rail transport must also be considered.

### *Moose*

Moose habitat, which includes balsam fir-white birch stands (mixed forest), swamps, lakes and water bodies, is available in large quantity at the regional scale, including in the Matimek controlled harvesting zone. In addition,

the various data provided by the proponent and corroborated by the Quebec Department of Forests, Wildlife and Parks<sup>70</sup> indicate that the moose population on the North Shore is stable and healthy.

The impacts of the Arnaud project on moose, and particularly those related to habitat losses could combine with the effects of other past and present projects, such as the construction of power transmission lines, the 170 km of snowmobile trails that have been created, and the construction of the Sainte-Marguerite hydroelectric complex and reservoir.

In addition, the high-voltage line intended to connect the La Romaine-1 and La Romaine-2 generating stations with the Arnaud substation, which will run alongside the existing lines, will require widening the right-of-way of the existing corridor. Habitat alteration during the clearing and construction period may have an adverse effect on the moose populations over the short term. However, the subsequent creation of regenerating environments, which constitute favourable habitats for moose, is a positive impact for the species in the medium term.<sup>71</sup>

#### *Species at risk*

The clearing and site preparation activities of the Arnaud Project would destroy approximately 1,285 ha of habitat for birds and terrestrial wildlife, including approximately 24 ha of wetlands. These losses, combined with the other resource-based activities in the region, such as the La Romaine hydroelectric Project and the connection of the La Romaine-1 and La Romaine-2 generating stations to the Arnaud substation, could have impacts on the olive-sided flycatcher, common nighthawk and bats of the genus *Myotis*. Habitat destruction and degradation contribute directly or indirectly to the decline of these more vulnerable species.

The proponent considers that the habitat losses caused by the Project (see Section 7.6.1) would be compensated by the progressive and final restoration programs as well as by the wetlands compensation program which will generate large areas of habitats for these species over the years.

The proponent considers that the Project will have a positive effect on common nighthawk in the medium term (see Section 7.6) and that there would therefore be no cumulative effect on this species.

The olive-sided flycatcher is more likely to be found in or near wetlands. As mentioned in Section 7.6.1, the Arnaud Mining Project could affect one or two breeding pairs, based on the estimate of the area of habitats potentially suitable for this species. Considering the planned mitigation measures, the restoration of the wetlands and the nature of the anticipated residual effect, which will be of low intensity, the potential cumulative effect on this species would be limited.

In the case of bats of the genus *Myotis*, natural habitats suitable for these species extend over a vast area around the periphery of the mining site. The types of environments that may suffer permanent losses are not considered rare environments in the region.

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<sup>70</sup> Quebec Department of Forests, Wildlife and Parks (MFFP) 2004-2010 Moose Management Plan. September 2004. 265 p.

<sup>71</sup> Young forests, for example those that have been affected by logging, forest fires or insect infestation, constitute favourable habitats for moose.

### 7.8.3 *Mitigation measures*

Considering the low probability that the Project results in significant cumulative effects, no additional measures, over and above those intended to mitigate the effects of the Project on air quality, terrestrial wildlife and species at risk (see Appendix B), were identified as required in order to mitigate cumulative effects.

### 7.8.4 *Government, public and Aboriginal comments*

Members of the public asked the proponent to conduct an analysis of the cumulative effects on des Rapides Lake drinking water source and Sept-Îles Bay. The proponent does not anticipate that the Project will result in any residual effects on these valued components and therefore did not take them into account in the cumulative effects analysis. The Agency notes that the proponent is willing, as a business based in the region and a future user of the Port of Sept-Îles, to participate in initiatives that may be proposed by groups in the region to study the impacts of human activities on Sept-Îles Bay like the “Observatoire pour la veille environnementale de la baie des Sept Îles” (observatory for environment watch of Sept Îles Bay).

The Federal Committee and the public also expressed concerns about the impact of the project on moose in terms of the fragmentation of the territory and loss of quality habitat to the south of the study area. Out of concern for minimizing the impacts on this species, the access road and explosives storage site, initially planned in an area where moose are present, have therefore been relocated. Relocation of the railway line and snowmobile trail routes was also planned, where possible, to run parallel with the existing rights-of-way (power lines) in order to avoid further fragmenting the territory. In addition, the proponent plans a progressive restoration of the mining site, which will create new habitats for moose.

Concerns were expressed about the cumulative effects of the emissions of fine particulate matter in the Place Ferland neighbourhood, located approximately 4 km from the eastern end of the pit. This sector of the municipality of Sept-Îles experiences a problem with levels of fine particulate matter several times a year (particularly in winter) caused by the use of wood for heating. According to the modelling carried out by the proponent, the maximum concentration of fine particulate matter generated by the operations of the future mine would be less than  $1 \mu\text{g}/\text{m}^3$  in the Place Ferland neighbourhood. The contribution of fine dust by the Project would therefore be negligible and would not cause any additional impact for the residents of this neighbourhood.

The Federal Committee also notes that a consultation committee on air quality has been established in Sept-Îles at the initiative of the municipality and the Corporation de protection de l’environnement de Sept-Îles (environmental protection association of Sept Îles). The mandate of this committee is to facilitate the development of an overall picture of the air quality situation in Sept-Îles, identify any problems and develop potential solutions. The proponent has agreed to communicate the data from its air quality monitoring stations to the group that will be designated by this consultation committee to update the information on air quality.

### 7.8.5 *Agency conclusions on the significance of the residual environmental effects*

In view of the good ambient air quality in Sept-Îles and the distance of the various sources of atmospheric emissions from the mine site, the Agency concludes that the cumulative effects of the Project on air quality are low.

The moose population on the North Shore is stable and healthy and its habitats are abundant in the region. The cumulative effects on this species are considered low by the Agency.

The Agency considers that the cumulative effect on species at risk is likely to be low in the construction and operation phases, since it would be of limited duration and low intensity considering the wide availability of similar habitats in the region where the project is located. In addition, the cumulative effect over the longer term would be negligible in view of the planned mitigation measures and the restoration of the mining site.

## 7.9 Effects of the Environment on the Project

According to the former Act, any change to the project that may be caused by the environment must also be taken into account in the determination of the environmental effects. The proponent examined the effects of the environment on the Project and proposed measures aimed at reducing them.

### 7.9.1 *Potential effects*

The environmental factors likely to have an impact on the Project and to result in environmental effects include earthquakes, forest fires and the impacts of climate change, such as more intense precipitation.

The Project is located in a zone of moderate seismicity.<sup>72</sup> According to historical data, no major earthquake (greater than magnitude 7 on the Richter scale) has ever been reported or recorded. Only two events have exceeded magnitude 5 over the past 100 years, including one located some 60 kilometres to the south of Sept-Îles. Based on Natural Resources Canada data, the probability of occurrence of an earthquake of a magnitude greater than 5 near the mining facilities is low.

According to information available in the Canadian National Fire Database,<sup>73</sup> the assessment of forest fire risk, based on weather conditions and type of vegetation, shows that the Project is located in a low-risk zone.

The anticipated effects of climate change for Northern Quebec are:

- an increase in average temperatures, with a more pronounced increase in average winter temperatures than in average summer temperatures;
- an increase in winter precipitation and to a lesser extent in summer precipitation;
- an increase in temperature extremes and heavy precipitation (Ouranos, 2010).

The starch storage silo is a project component that is sensitive to the above-mentioned anticipated effects, since the internal temperature of the silo is an important safety management parameter. Given the fact that the anticipated temperature increases would be greater during the winter, the impact of these increases would be relatively insignificant relative to the current situation, and the associated risk would therefore be low.

According to the proponent, episodes of heavy precipitation caused by climate change could alter surface water flows and have serious consequences such as the flooding of Route 138 and of homes close to Clet Creek.

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<sup>72</sup> Natural Resources Canada. [Earthquake zones in Eastern Canada](#). Website accessed November 2014.

<sup>73</sup> Natural Resources Canada. [Canadian Wildland Fire Information System](#). Website accessed November 2014.

There is an increased risk of shoreline erosion associated with the increase in average winter temperatures, which could result in an increase in sea level and a shorter ice season. The risk of erosion would mainly affect the wharf under the responsibility of the Sept-Îles Port Authority and would not have any impact on the proponent's facilities at the Port of Sept-Îles.

### 7.9.2 *Mitigation measures*

The proponent has factored the impact of climate into the design of its project. For example, the Clet Creek culvert, the dikes of the tailings site and the settling basin will be sized according to a 1:1,000 year flood.<sup>74</sup> Similarly, the design of the dam will take into account a 1:10,000 year flood in order to contain extreme floods that may be caused by climate change. For more details on the risk of failure of dikes or the dam, see Section 7.10.

With respect to the impact of earthquake risks on Project infrastructure, the proponent has agreed to build the works taking the seismicity zone into account and in compliance with the requirements of the National Building Code 2010<sup>75</sup> and updates, where applicable.

The proponent has provided a broad outline of its emergency plan, and extreme situations will be taken into account, particularly those involving forest fires, earthquakes or heavy precipitation.

### 7.9.3 *Government, public and Aboriginal comments and proponent's response*

Both the Federal Committee and the Aboriginal communities asked the proponent to consider climate change in the environmental assessment and the design of the project works. The proponent has agreed to take the consequences associated with climate change, as set out in the document prepared by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment<sup>76</sup> into account in the design of its project.

The Federal Committee notes that the proponent has agreed to conduct monitoring of the integrity of certain works through annual visits for five years following closure of the mine. This monitoring will consist in visual inspections of the dikes, waste rock piles and drainage ditches in order to note any anomaly that might compromise the stability of these works. In addition to regular monitoring, visual inspections will also be carried out following any event that could have an impact on the stability of the works.

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<sup>74</sup> Centre d'expertise hydraulique du Québec. A 1:1,000 year flood is a statistical probability that a rainfall event of a given magnitude may occur at a frequency of once every thousand years. Statistically, it has one chance in a thousand of occurring during a particular year.

<sup>75</sup> National Research Council Canada. [National Building Code of Canada 2010](#). Website accessed November 2014. To be updated in December 2015.

<sup>76</sup> Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (2003). [Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners](#)



#### 7.9.4 *Agency conclusions on the significance of the residual environmental effects*

The Agency considers that the proponent has taken the effects of the environment into account in the design of its project. In view of the risks mentioned in this chapter, the proposed mitigation and monitoring measures and the emergency measures planned by the proponent, the Agency concludes that the environmental conditions are not likely to have significant adverse effects on the project.

### **7.10 Effects of Potential Accidents or Malfunctions**

The environmental effects caused by accidents or malfunctions are among the factors to be examined pursuant to the former Act. The proponent identified the activities most likely to cause accidents or malfunctions during the mine construction, operation and closure phases, the potential adverse environmental effects as well as the planned emergency response measures.

#### 7.10.1 *Potential effects*

The proponent has developed a strategy intended to minimize the occurrence of accidents and malfunctions. The proponent first of all identified the following activities which represent a high risk for the environment: the storage and handling of petroleum products, the management of reagents and chemicals, the management of the tailings site and settling basin, rail transport and blasting.

The second step in this process was to identify potential accidents and malfunctions that could have significant consequences. Appendix H provides a summary of the analysis of the risks identified by the proponent. The accidents and malfunctions that represent a risk for the environment are:

- spills of various petroleum products (oils, greases and fuels) related to breakages, fires or spills by vehicles;
- spills of chemicals related to breakages, human error, etc.;
- spills of contaminated water and failure of dikes of the tailings site and settling basin;
- spills of apatite during a train derailment;
- vibrations and projections of rocks off site and other incidents associated with blasting.

Of these potential accidents and risks, the failure of the settling basin dam or tailings site dikes could have major environmental consequences. When settling basins containing tailings fail, they spill large quantities of contaminated water, which can result in the death of aquatic wildlife and contaminate water bodies over a distance of many kilometres downstream of the accident.

#### 7.10.2 *Mitigation measures*

The proponent has developed a risk management program which incorporates all the measures intended to reduce the risks of accidents and malfunctions. This program includes measures intended to reduce the risk posed by the failures of dikes and dams, such as the installation of equipment to measure dike movements and water levels. The proponent plans to build a diversion dike which would direct the flow of water and sludge toward the pit in the event of failure or overflow of the settling basin dam.

Despite all the precautions that will be taken to reduce risks, the proponent recognizes that certain accidents are nonetheless likely to occur. The proponent has therefore agreed to develop an emergency plan which will detail

the response criteria, the roles and responsibilities of the various responders, in particular an emergency squad, the response procedures, as well as the location of the emergency equipment at each high-, medium- and low-risk site. The plan will include specific procedures for response in the event of a dike or dam failure. This emergency plan would be kept up to date and would be verified annually by a third party. The proponent states that all employees would receive training on the emergency plan and that an employee training and awareness-raising approach would be used to promote prevention.

### *7.10.3 Government, public and Aboriginal comments and proponent's response*

Members of the public and of Aboriginal communities raised concerns about the risks of dike or dam failure owing to exceptional rains, landslides or blasting in the pit. The Federal Committee notes that, in addition to the mitigation and safety measures (see Appendix B), the proponent has also agreed to institute a dike monitoring and inspection program. In addition, in order to effectively address the risks of landslides caused by the presence of marine clay layers, the province will impose on the proponent a specific condition that will require carrying out stabilization work on the banks of Clet Creek in accordance with the requirements of the Quebec Department of Transportation.

The Canadian Transportation Agency asked the proponent to assess the risks to the railway line related to blasting. According to the proponent's estimates, the railway line, which is approximately 500 m from the pit, would be exposed to vibrations on the order of 5 millimetres/second or less, which is below the maximum permitted velocity of ground vibrations of 12.7 millimetres/second prescribed by Directive 019. Blast walls will be installed to protect the infrastructure, including the railway line, during digging of the pit at the beginning of mine operations. Vibrations will be monitored by the proponent by means of seismographs.

The Canadian Transportation Agency asked the proponent to provide more detailed data concerning the potential risks posed by the vibrations emitted by rail operations on the settling basin and dam. The proponent conducted an analysis of the vibrations caused by the passage of ore-laden trains. According to this analysis, the vibrations will be dampened by the fill of the access road that is located between the railway line and the dam. In addition, the clayey soil on which the dam will be built would be consolidated by means of drains which will evacuate the water contained in the clay, which would reduce the risks of liquefaction caused by vibrations and landslide risks.

Health Canada is of the opinion that misfiring accidents and failures during blasting could result in abnormally high emissions of oxides of nitrogen. Citizens' groups have also questioned the proponent on this issue. The proponent explained that the risk of such incidents is generally associated with the presence of water in the blast holes and with overcharging of blast holes owing to the presence of fissures or faults in the rock. In order to prevent this type of accident or failure, the proponent has agreed to institute preventive measures such as using water-resistant explosives. The proponent has also agreed to monitor the drilling reports identifying the presence of faults or fissures in order to avoid the risk of overcharging the blast holes. The proponent has agreed to include the toxic gas cloud scenario in its emergency plan and to take weather conditions into account in managing blasting in order to prevent the values from exceeding air quality standards. The consultation and monitoring committee will be responsible for managing complaints concerning air quality and the acoustic environment.

The community of Uashat mak Mani-Utenam stressed the importance that the Project equipment and facilities meet the various codes, standards, acts and regulations, particularly the Quebec *Building Act* (Construction Code, Safety Code). The proponent has formally committed to comply with these requirements, and in particular to ensure that all petroleum product storage tanks are double-walled. In addition, all storage tanks, including those containing caustic soda and soybean oil, will be equipped with a secondary containment dike capable of receiving up to 110% of the maximum capacity of the storage tanks, thereby reducing the risks of chemical spills in the environment.

#### 7.10.4 *Agency conclusions on the significance of the residual environmental effects*

The Agency is of the opinion that the proponent has identified and assessed the potential accidents and malfunctions associated with the Project. The Agency notes that the Project has been designed to prevent such incidents and that an emergency plan and a risk management program will be developed in order to manage these situations, where applicable. In view of these considerations, the Agency is of the view that accidents or malfunctions that could result in significant adverse residual effects are unlikely to occur.

### **7.11 Effects on the Capacity of Renewable Resources**

In accordance with the requirements of subsection 16(2) of the former Act, the Agency must consider the capacity of renewable resources likely to be significantly affected by the project to meet the needs of the present without compromising the possibility for future generations to meet their needs.

The potential effects of the Project on renewable resources, water, terrestrial wildlife, birds and fish were assessed in detail in the environmental impact statement. Special attention was paid to water resources, fish and fish habitat, birds and other wildlife species.

The effects of the Project on each of these resources were assessed in accordance with the scope of the project assessment (see Sections 7.3, 7.4, 7.5 and 7.6). The significance of the residual effects was also assessed (see Appendix E). This assessment shows that the Project's effects will not compromise the environmental integrity of these valued components and will not significantly or irreversibly alter their use. Consequently, the Project will not significantly reduce the ability of current or future generations to obtain drinking water supplies or harvest wildlife, and will not compromise the viability of fisheries or the sustainability of ecosystems.

Considering the implementation of the planned mitigation and compensation measures, the Agency concludes that the project is not likely to cause significant adverse environmental effects on the capacity of renewable resources.

## 8 Follow-up Program under the Canadian Environmental Assessment Act

Pursuant to the former Act, every comprehensive study shall include a consideration of the need for, and the requirements of, a follow-up program, for verifying the accuracy of the conclusions of the environmental assessment and determining the effectiveness of the measures taken to mitigate the adverse environmental effects of the project. The results of a follow-up program can also be used to support the implementation of adaptive management measures aimed at mitigating unforeseen adverse environmental effects.

Fisheries and Oceans Canada and the Canadian Transportation Agency, the responsible authorities, must ensure that a follow-up program is developed and implemented to their satisfaction and with the support of federal authorities. Other follow-up measures may be required by authorizations potentially issued by the federal government. The proponent must subsequently provide detailed monitoring protocols to the responsible authorities. For example, an environmental monitoring program of the proponent's activities at the Port of Sept-Îles will be developed and submitted to the Sept-Îles Port Authority for approval before commencement of the construction work at the port. This program will include in particular periodic inspections of the impermeability and effectiveness of the infrastructure as well as monitoring of water and air quality around the perimeter of the facilities.

The proponent has undertaken to conduct monitoring of air quality, noise levels and vibrations, groundwater, surface water and sediments, benthos and fish, bats, as well as dike stability. It has also established a consultation and monitoring committee with the participation of public organizations and the community of Uashat mak Mani-Utenam.

To develop the outline of the federal follow-up program required as part of the environmental assessment, the Federal Committee took into account the proponent's commitments and the provincial requirements, and identified follow-up requirements that fall within the areas of jurisdiction of the federal government. These requirements were determined on the basis of the nature of the Project's environmental effects, the uncertainties concerning the predictions or effectiveness of the mitigation measures, as well as the concerns raised by the public and Aboriginals. The proponent has agreed to implement the monitoring measures described below.

### 8.1 Human Health

Air quality monitoring is required at the federal level since fine particulate matter (PM<sub>2.5</sub>) emissions are a concern from the standpoint of protection of human health. The proponent has agreed to deliver the PM<sub>2.5</sub> monitoring results to the responsible federal authorities from the construction phase until the end of restoration of the mining site.

The Sept-Îles Port Authority will ask the proponent to submit a monitoring program specific to the port facilities before commencement of the construction work at the port. This program will include in particular the monitoring of air quality in the area of the proponent's port facilities.

## 8.2 Water Resources

### *Surface water*

In addition to the monitoring requirements prescribed in the *Metal Mining Effluent Regulations*, with which the proponent must comply, the quality of the treated effluent will also be monitored by the proponent for phosphorus, fluorides and vanadium, chemical components likely to be present in the mine waste and effluent. This monitoring will make it possible to prevent these substances from causing significant effects on water resources and on fish habitat. This monitoring must begin at the same time as the monitoring prescribed by the *Metal Mining Effluent Regulations* and must be in accordance with the *Metal Mining Effluent Regulations* procedures. The monitoring will be re-assessed on the basis of the results obtained and will be reviewed as needed.

The Sept-Îles Port Authority will ask the proponent to submit a monitoring program specific to the port facilities before commencement of the construction work at the port. This program will include in particular monitoring of the quality of the water in the vicinity of the proponent's port facilities.

### *Groundwater*

Monitoring of groundwater levels, by means of four observation wells in addition to those already planned by the proponent, is required in the areas where the impact of the drawdown of water could be greater. This monitoring will be carried out during the period of operation of the mine and will make it possible to verify the predictions of the potential impacts of the Project on the interactions between surface water and groundwater as well as the impacts on fish habitat.

The proponent will also have to install flow gauging stations for certain watercourses (streams R10 and R11 and Gamache Creek) in order to verify the impact of the drawdown of the water table caused by the pumping of the dewatering water on the flow of these watercourses. This monitoring, which must be carried out during the period of operation of the mine, will make it possible to verify the predictions of the potential impacts of the Project on water resources as well as on the serious harm caused to fish. More specifically, this monitoring will make it possible to assess maintenance of the hydraulic and physicochemical conditions conducive to spawning and incubation of eggs of brook trout on the spawning grounds of streams R10 and R11 and Gamache Creek. A monitoring of the physicochemical conditions of these spawning grounds must also be conducted. Depending on the monitoring results, the proponent may be required to take corrective action.

In addition, during operation of the mine, monitoring of the quality of the groundwater pumped from the pit must be carried out in order to measure the following ions: sodium, calcium, potassium, magnesium, sulfate, chloride and carbonate. This monitoring will make it possible to quickly detect the advancement of the salinity front from the Sept-Îles Bay toward the pit.

## 8.3 Fish and Fish Habitat

Monitoring is required in order to ensure compliance with the requirements related to the issuance of authorizations under the *Fisheries Act*. The proponent must meet the prescribed compensation objectives, confirm the integrity and effectiveness of the habitat enhancement and compensation measures, and take corrective action where warranted according to the monitoring results. The proponent must provide a reference

state if required. This monitoring will be supervised by Fisheries and Oceans Canada. The monitoring of the drawdown of the water table which will verify maintenance of the conditions (water level and flow, physicochemical characteristics) of the brook trout spawning grounds in streams R10 and R11 and Gamache Creek will make it possible to determine whether serious harm to the spawning grounds could be attributable to the Project and, where applicable, to adjust the compensation plan accordingly.

Moreover, because of uncertainties regarding the long-term effects of the mine effluent discharge on the Sept Îles Bay, the proponent must conduct a plume modelling of Clet Creek in Sept Îles Bay in order to define the area of influence of this creek in the bay following the discharge of mine effluent. The proponent must conduct a follow-up, which will include a characterization of the current (initial) conditions of the eelgrass bed in the area located around the mouth of Clet Creek before the creek is diked.

This characterization will be used as a reference for the required future follow-up. The characterization and the monitoring of the eelgrass bed must include, without being limited to, the five major known stressors for eelgrass, namely, sedimentation, turbidity, nutrients, salinity, biochemical oxygen demand, current flow patterns and physical damage or removal. The monitoring must also provide for the characterization of benthic communities and sediment quality (particle size, total organic carbon and contaminants). Based on the results of the characterization and the monitoring conducted, Fisheries and Oceans Canada may make changes to the follow-up program (parameters, frequency and duration). Corrective action may be required depending on the follow-up results.

## **8.4 Bird and Bird Habitat**

During the Project construction phase, the proponent will document, by means of environmental monitoring reports, the presence of nests of migratory birds and species at risk, as well as the actions taken to ensure their protection. This measure will help ensure compliance with federal legislation, namely the *Migratory Birds Convention Act, 1994* and the *Migratory Birds Regulations*.

During the mine closure phase and after carrying out revegetation work, the proponent will monitor migratory birds, particularly species at risk, in order to verify the effectiveness of the site restoration. More specifically, the proponent must compare the diversity and abundance results obtained at control sites (reference state) with the data for migratory birds in the areas modified by the Project. As the basis for comparison, the proponent will have to use estimates of landbird and shorebird breeding pair losses by species and habitat presented in Section 7.6.1.

## **8.5 Use of Land and Resources for Traditional Purposes**

From the construction phase until restoration of the mining site, the proponent will regularly consult traditional users of the area concerning noise levels on the coastline of Sept-Îles Bay, particularly the section between Hall River and des Rapides River, in order to detect any problems and quickly provide solutions. This follow-up could take place through the consultation and monitoring committee and through a complaint resolution system that will be instituted.



**Table 8 Elements of the federal follow-up program**

Valued component	Program elements	Timeframe and/or frequency
Water resources	<p><u>Surface water</u>: monitoring of total concentrations of phosphorus, fluorides and vanadium, in addition to the monitoring already prescribed by the <i>Metal Mining Effluent Regulations</i>.</p>	<p>The entire period of operation of the mining site in accordance with the procedures set out in the <i>Metal Mining Effluent Regulations</i>.</p>
	<p>Monitoring of flow gauging stations for certain watercourses (streams R10 and R11 and Gamache Creek) in order to verify the impact of the drawdown of the water table caused by the pumping of the dewatering water on the flow of these watercourses.</p>	<p>The entire period of operation of the mining site (pumping of the dewatering water).</p>
	<p><u>Groundwater</u>: monitoring of groundwater levels, through four observation wells in addition to those already planned by the proponent; monitoring of groundwater pumped from the pit in order to detect advancement of the salinity front from the Sept-Îles Bay toward the pit.</p>	<p>The entire period of operation of the mining site (pumping of the dewatering water).</p>
Human health	<p>Monitoring of emissions of fine particulate matter (PM<sub>2.5</sub>). This monitoring must be carried out continuously.</p>	<p>From the beginning of construction until the end of restoration of the mining site.</p>
Fish and fish habitat	<p>Monitoring of the fish habitat compensation objectives as well as the integrity and effectiveness of the habitat enhancement and compensation measures.</p>	<p>To be determined in the permit conditions of Fisheries and Oceans Canada.</p>
	<p>Monitoring of the maintenance of the conditions (water level and flow, physicochemical characteristics) of the brook trout spawning grounds in streams R10 and R11 and Gamache Creek to verify the proponent's predictions.</p>	<p>The entire period of operation of the mining site (pumping of the dewatering water).</p>
	<p>Characterization and monitoring of the eelgrass bed of Sept-Îles Bay toward the mouth of Clet Creek.</p>	<p>Characterization of the eelgrass bed before the damming of Clet Creek. The monitoring will begin at the same time as the MMER and continue for the full duration of operation of the mining site.</p>
Birds and bird habitat	<p>Monitoring of migratory birds, particularly species at risk, in order to verify the effectiveness of site restoration.</p>	<p>From the beginning of the operation phase until the end of the restoration phase.</p>
	<p>Production of environmental monitoring reports during the project construction phase to document the presence of nests of migratory birds and species at risk, and actions taken to ensure their protection.</p>	<p>During the construction of the mining site.</p>
Use of lands and resources for traditional purposes	<p>Monitoring of noise in consultation with traditional users of the area will be implemented through the consultation and monitoring committee and a complaint resolution system.</p>	<p>From the construction phase until the end of operation of the mine.</p>

The federal authorities will collaborate with the proponent in developing the details of the monitoring and follow-up program in keeping with their respective mandates and expertise. The program will take into account the conditions and requirements set out in federal and provincial authorizations and approvals required to carry out the Project, potential changes affecting environmental conditions, and environmental effects that could arise during Project implementation. The results of the monitoring and follow-up program will be reported to the departments and agencies concerned. The results, or instructions on how to obtain the results, will be posted on the Agency's Canadian Environmental Assessment Registry ([www.ceaa-acee.gc.ca](http://www.ceaa-acee.gc.ca)).

## 9 Benefits of Environmental Assessment

The environmental assessment process provides an opportunity to consider improvements to the environmental performance of a project, starting at the planning stage, and to reduce its adverse impacts on the environment, while making the project more socially acceptable. These benefits will accrue to both present and future generations.

The Agency has assessed the potential effects of the Project on the valued components in collaboration with the Federal Committee. The Agency also considered the input of the members of the public and Aboriginals who expressed their views during the consultations.

By examining the alternatives to the project, the environmental assessment provides an opportunity to improve the design of projects. For example, in the case of the Arnaud Mining Project, the proponent made significant changes to the layout of its tailings cells in order to determine the optimal location for the mine waste storage site. The removal of a flotation tailings cell significantly reduces the magnitude of the potential environmental effects on water resources as well as on the loss and degradation of habitat for fish, birds and terrestrial wildlife. The table below provides an overview of the environmental benefits of this change made to the Project.

**Table 9 Comparison of the impacts of the project before and after removal of the west flotation cell**

Element of the environment	Losses before changes to the project (hectares)	Losses after changes to the project (hectares)	Benefit
Wetlands affected	42	25	<b>17</b>
Forest affected	1,346	1,033	<b>313</b>
Fish habitat affected – lakes and streams	23	8.5	<b>14.5</b>
Mammal habitat affected	1,346	1,285	<b>61</b>
Bird habitat affected	1,538	1,285	<b>253</b>

The implementation by the proponent of the mitigation measures and a monitoring program will help prevent or reduce adverse environmental effects on several valued components. This is the case in particular of the water treatment system, which will substantially mitigate the effects of the Project on water resources. This is also the case of the transport of the waste rock, which will be interrupted during specific weather conditions in order to reduce the impacts on human health associated with the atmospheric emissions of the Project.

Following discussions with Fisheries and Oceans Canada, the proponent has agreed to conduct a characterization and monitoring of the eelgrass bed in the Sept-Îles Bay in the area near the mouth of Clet Creek, which will make it possible to minimize the impacts on fish habitat. The proponent will develop a fish habitat compensation plan in collaboration with Fisheries and Oceans Canada. These measures will help significantly reduce the project's impacts on fish and fish habitat.

## 10 Conclusion and Recommendations of the Agency

To reach a conclusion on the significance of the environmental effects of the Project, the Agency considered the following elements:

- the documentation submitted by the proponent;
- the analyses and findings of the Federal Committee;
- the opinions and comments received from the public and the Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John;
- the proponent's obligations, as set out in the order issued in February 2015 under the Quebec *Environment Quality Act*;
- the obligation to obtain authorizations under the *Fisheries Act* for work that will cause the loss or disruption of fish and fish habitat, and for the deposit of tailings in waters frequented by fish.

Taking into account the implementation of the proposed mitigation measures and the commitments made by the proponent, the Agency is of the opinion that the Project is not likely to cause significant adverse environmental effects. The proponent must implement a monitoring program and share the results with the federal authorities as well as with the consultation and monitoring committee that the proponent has established. Following a public consultation on this report, the Minister of the Environment will decide, taking into account the implementation of the proposed mitigation measures, whether the project is likely to cause significant adverse environmental effects.

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# 12 Appendices

Activity	Alternatives	Decision Criteria
<b>Transportation of concentrate</b>	A Rail transportation <b>(Alternative selected)</b>	Little development required, use of an existing corridor. Lower greenhouse gas emissions than for road transportation. No disturbance to biophysical environment. Increase in noise near urban centres: minimal. Increase of one train per day. Slight increase in risk of accidents. Higher construction cost. Lower operating cost.
	B Road transportation	High GHG emissions. Minimal increase in noise near urban centres. Increase of 3.1 to 4.5 trucks/hour. Increased risk of accidents.
	C Conveyor belt	Construction to allow the conveyor belt to pass over roads. Disturbance to biophysical environment. Powered by electricity. Medium risk of contamination and leakage. Minimal increase in noise near urban centres. Very high cost.
	D Pipeline	Addition of concentrate dehydration and drying facilities at the port. Disturbance to biophysical environment. Impact on water and energy resources. Significant risk of contamination and leakage. Minimal increase in noise near urban centres. Higher construction cost. Lower operating cost.
<b>Tailings disposal methods</b>	A Slurry tailings	Accumulation of a large quantity of water in the tailings pond, with potential risk of leaks or failure.
	B Thickened tailings <b>(Alternative selected)</b>	Suitable given production rate Suitable in terms of discharges from concentrator Management of a moderate amount of water in tailings pond
	C Paste tailings	This method is not suitable given the mine's high production rate. The properties of discharges from the concentrator make this method unsuitable.
	D Filtered tailings	This method is not suitable given the mine's high production rate.
<b>Location of tailings pond</b>	A (see Figure 5) <b>(Alternative selected)</b>	Option with the largest area of fish habitat loss. Option with the least impact on watersheds, terrestrial and wetland environments, and air quality, as well as the lowest environmental risks.

Activity	Alternatives	Decision Criteria
	E + A2 (see Figure 5)	Option with the greatest risk of accidents and malfunctions and the greatest environmental damage in the event of an accident or malfunction. Option with the greatest impact on watersheds, terrestrial and wetland environments, and air quality.
Location of waste rock pile	S2 (see Figure 5) <b>(Alternative selected)</b>	Option with fewer impacts on water bodies and on fish habitat, with the smallest area of impacted terrestrial habitat and wetlands. Option closest to the pit and requiring less transportation. Most advantageous from an economic standpoint.
	S3 (see Figure 5)	Option with the largest area of fish habitat loss. The greater distance from the pit would have a more pronounced impact on air quality and lead to greater damage in the event of an accident or malfunction, in addition to presenting technical constraints.
	S4 (see Figure 5)	Option with the greatest potential impact on groundwater owing to the low bedrock permeability. The greater distance from the pit would lead to a greater impact on air quality and damage in the event of an accident or malfunction, in addition to presenting technical constraints.
Mine waste storage methods	A Slurry tailings	A large amount of water would accumulate in the tailings pond, increasing the risk of liquefaction and dike failure as well as increasing pumping costs. In addition, larger capacity impoundment areas and longer post-closure monitoring would be required.
	B Thickened tailings	This method is suitable given the mean production rate of 30,000 t/day. The water that accumulates in the pond may be recirculated to meet the needs of the ore processing plant. The particle size of the tailings makes this method suitable.
	C Paste tailings <b>(Alternative selected)</b>	This method is unsuitable given the mine's high production rate. This method is not suitable taking into account the particle size of the tailings.
	D Filtered tailings	This method is not suitable given the mine's high production rate; it can be used up to a maximum production rate of 20,000 t/day.
Access road to mine site	A West option, via Route 138, 1 km east of the Hall River Bridge <b>(Alternative selected)</b>	Construction of culvert. Required road length is 4.2 km. No Project schedule delay. Streams crossed: 9 streams (Road does not run along streams). Tree clearing over 6.8 ha (spruce-moss woodland and balsam fir-moss woodland); two wetlands (0.2 ha). Culverts to cross Clet Creek, less damaging for fish habitat. Higher greenhouse gas emissions (1.5 X more than the east option)

Activity	Alternatives	Decision Criteria
		<p>Increase in traffic on Route 138 Construction of a turning lane</p> <hr/> <p>Construction of a bridge Length of bridge to be built is 6.5 km. Project schedule delay is likely. Streams crossed: 4 Road runs along streams over distance of 300 meters. Tree clearing on 10.4 ha (balsam fir-moss woodland, black spruce-moss woodland). One wetland (1 ha). Construction of a bridge over des Rapides River, serious harm to fish and fish habitat. Lower greenhouse gas emissions. No increase in traffic on Route 138. Very low construction cost. High operating cost.</p>
<b>Ore concentration</b>	A Flotation <sup>77</sup>	<p>Flotation circuit with flotation columns: better apatite concentration and fewer impurities. Combination of environmentally friendly and low cost reagents: wheat starch, soybean oil and caustic soda</p>
<b>Industrial water supply</b>	A Surface water	<p>High construction cost. Lower operating cost. Pumping station, primary treatment and pipeline required. Length of piping 5.9 km. Disturbance to biophysical environment from construction. Impact on local water resources. Possibility of major usage conflicts. Lower investment cost.</p>
	B Recirculation of mine water from site <b>(Alternative selected)</b>	<p>Double treatment including settling, neutralization, sludge thickening and nanofiltration. Length of piping 0.5 km. No disturbance to biophysical environment. No impact on local water resources. Lower possibility of usage conflicts. High investment cost.</p>
<b>Drinking water supply</b>	A Groundwater supply – drilling of a well	<p>Vulnerable to fluctuations in water table (cone of depression caused by pumping of water from the pit). Good water quality. Low cost.</p>

<sup>77</sup> Only process that exists for concentrating apatite ore; alternatives relate to the use of reagents and flotation equipment.

Activity	Alternatives	Decision Criteria
	<p>B Surface water supply</p>	<p>Significant maintenance, vulnerability. Acceptable water quality. Costly.</p>
	<p>C Treatment of supernatant effluent from the polishing pond</p>	<p>Significant maintenance, vulnerability. Acceptable water quality. Costly.</p>
	<p>D City of Sept-Îles water system, located about 3 km from the plant <b>(Alternative selected)</b></p>	<p>Supercharger and chlorine injection required. Acceptable water quality. Costly.</p>

## Appendix B Mitigation measures

This appendix presents, for each valued component, the mitigation measures that the Canadian Environmental Assessment Agency believes are necessary to mitigate the environmental effects of the Arnaud Project. The proponent has agreed to implement all these mitigation measures.

To avoid repetition, when mitigation measures apply to more than one valued component, a reference is provided in the text.

Note that additional mitigation measures may be prescribed in authorizations that may be issued by the federal government. The proponent must also comply with the Sept-Îles Port Authority's environmental practices and procedures manual.

### Human health

#### *Emissions of particulates, metals and gaseous compounds*

1. Implement the dust management plan, which includes many detailed measures for mitigating the main sources of dust emissions during all Project phases. This plan will be updated by the proponent depending of the air quality monitoring results;
2. Reduce or temporarily halt the transportation of waste rock when the results of continuous monitoring of air quality indicate exceedances of the air quality standards set out in Quebec's *Clean Air Regulation*;
3. Limit extraction to a maximum of 75,000 tonnes per day.

#### *Greenhouse gas emissions*

4. Reclaim/use wood from tree clearing done on the mine site;
5. Use electricity as the main source of energy for all ore processing activities;
6. Implement various energy efficiency and conservation methods such as eco-driving training for truck drivers who transport ore from the pit to the crusher;
7. When purchasing new or replacement equipment, take energy efficiency into account by choosing the most energy efficient technologies available on the market;
8. Conduct an inventory of fuel and electricity consumption.

#### *Acoustic environment*

9. Construct a screening mound during the first five years of the Project along the entire south side of the pit;
10. Stop the construction of the screening mound at night-time;
11. Equip dump trucks with a rubber-coated tailgate or a tailgate that mitigates noise impacts;
12. Equip trucks and excavators with mufflers;
13. Install backup alarms using white noise on mobile equipment;
14. Replace some equipment (trucks, bulldozer, hammers) with less noisy models;
15. Use excavators equipped with acoustic insulation;

16. Avoid carrying out blasting operations when atmospheric conditions are unfavorable;
17. Limit blasting operations to one per day at a set time, with notification of the public (sign, telephone line and Web site) and complaint management system.

### **Water resources**

18. Construct a system of ditches to collect water around mining infrastructure, including water from the processing plant, mine water, and runoff from various mine waste and tailings dumps. All this effluent must be treated before it is discharged into Clet Creek, to ensure that it meets the standards of the *Metal Mining Effluent Regulations* and the criteria in Directive 019;
19. Manage the drainage water and seepage (groundwater) from ore, waste rock and overburden stockpile areas and from the tailings pond in accordance with the provisions in Directive 019;
20. Install ditches or use existing ditches to collect runoff at the port infrastructure site to prevent the deposit of deleterious substances into surface water and groundwater;
21. Construct the sedimentation pond berm at the very start of construction;
22. To prevent bank erosion in Clet Creek and flooding, modulate effluent discharge to follow the natural hydrological pattern of streamflow, with some spreading of spring flood waters;
23. Implement a set of sediment and erosion control measures to prevent sediment loading to the aquatic environment;
24. Supply water required for mine activities by recirculating drainage water and water pumped out of the sedimentation pond rather than by using surface water;
25. Optimize the blasting pattern and the method used to fill and clean blastholes in order to minimize the impacts;
26. Use only water-resistant explosives and programmable electronic detonators;
27. Implement an explosives management and handling plan to keep these compounds from entering groundwater;
28. Implement a risk management plan to reduce the risk of accidents and malfunctions;
29. Develop an emergency response plan to limit impacts on aquatic resources;
30. Minimize the number of oil tanks and machinery refuelling sites in order to reduce the number of sites at risk;
31. Equip Storage areas for unused and waste petroleum products with a dike capable of holding 110 % of the volume of the largest tank in order to contain accidental leaks and spills. Install drip pans and oil and grease interceptors;
32. Areas designated as permanent sites for routine maintenance, lubrication and refuelling activities must have a concrete pad;
33. Use a dewatering strategy that minimizes water table drawdown, for example, by pumping water only from the pit, rather than building a dewatering well ring around the pit;
34. Implement a management plan to detect problems related to pit dewatering (network of undetected fractures, quality of pumped water). This plan should include monitoring of groundwater quality and



pumped water, as well as updating the hydrogeological model prepared during pit development, which should include any new information on the hydrostratigraphic properties and on fracture networks.

#### **Fish and fish habitat**

35. Implement a compensation plan to offset the fish habitat losses which are estimated at 8.5 ha;
36. Comply with the design criteria and mitigation measures set out in the Fisheries and Oceans document entitled *Guidelines for Planning River Crossings in Quebec (2012)*;
37. Blasting operations must comply with the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998);
38. Refer to and apply mitigation measures for water resources related to water management. Refer to and apply the measures related to the risk of dam failure presented at the end of this appendix;
39. Implement a set of sediment and erosion control measures that must be maintained and kept in good order to prevent sediment loading to the aquatic environment, beyond the immediate work area;
40. When temporary structures are installed, ensure free flow of water at all times to maintain fish habitat functions downstream of the work area. Take the necessary steps to prevent and minimize impacts (e.g. flooding, dewatering, erosion, sediment transport) upstream and downstream of the work area.

#### **Terrestrial wildlife and its habitat**

41. Develop and apply a wetland compensation plan to be approved by the province;
42. Gradually stabilize, revegetate and reforest areas temporarily disturbed by work;
43. During the tailings pond restoration, plant windbreaks on cells 1 and 2, and maintain a wooded corridor between the waste rock pile and cells 1 and 2;
44. Maintain a riparian buffer strip of at least 20 meters;
45. Minimize the destruction, trampling and compaction of vegetation, soil and wetlands by clearly delineating the work areas as well as the travel and traffic routes used by workers and machinery (taped or fenced areas);
46. Limit tree clearing exclusively to areas required for future operations;
47. Raise awareness among workers about the importance of not feeding animals and not leaving food that would attract fur-bearing animals near work areas. Awareness raising can be carried out using posters and information sessions;
48. Apply the acoustic environment measures outlined in the section on human health;
49. To mitigate effects related to the risk of collisions, the proponent must take measures to limit the speed of vehicles and trucks at the mine site between 20 and 50 km/hour, depending on the location.

#### **Birds and their habitat**

50. Develop and apply a wetland compensation plan to be approved by the province;
51. Gradually stabilize, revegetate and reforest areas temporarily disturbed by work;

52. During all phases of the Project, act in a manner that protects and avoids injuring or killing migratory birds or disrupting or destroying their nests and eggs. In this regard, the proponent must take into account the Avoidance Guidelines, more specifically the version modified in 2014 by Environment Canada. The measures taken by the proponent to implement these guidelines will comply with the *Migratory Birds Convention Act, 1994*, and the *Species at Risk Act*;
53. Conduct tree felling and grubbing activities outside the period from May 1 to August 15, which is the main nesting season in the area;
54. Install two osprey nesting platforms;
55. Prohibit the disposal of woody debris or natural waste material in the flood plain and in wetlands such as swamps and peat bogs, even outside areas directly affected by the work;
56. Apply the acoustic environment measures outlined in the human health section;
57. Include an avifauna component, namely for the endangered species, in the environmental monitoring program which will be implemented by the proponent during construction and must verify the effectiveness of the protective measures that are put in place. The program will contain measures for preventing disturbance or harm to birds, nests or eggs;
58. The proponent has agreed to pay particular attention to the bird fauna that could potentially use the settling basin and, where appropriate, to use recognized bird scaring equipment.

#### **Current use of lands and resources**

59. Apply the measures outlined in the sections on human health, water resources, terrestrial wildlife, birds, and fish and fish habitat, which will help to mitigate project impacts on the current use of lands and resources for traditional purposes;
60. Prior to the start of work, conduct an exhaustive archeological inventory of the area that has Native American archeological potential in the R6 creek area near the future screening mound.

#### **Risk of dike failure**

61. Built to direct the flow of water and sludge toward the pit in the event of failure or overflow of the sedimentation pond dam;
62. Take into account the seismic data for the area in the design of dikes and dams;
63. Install alerting systems (sirens and pre-programmed telephone numbers) in inhabited areas that could be affected by dike failure;
64. Establish alerting methods for the Arnaud Railway Company and Hydro-Québec, the Sûreté du Québec (Quebec provincial police) and Quebec Department of Transport;
65. Provide information on emergency response measures (alerting, evacuation points, etc.) for people who could be affected in the event of dike failure;
66. Install prisms to monitor dike movement;
67. Install water level monitoring wells in dikes.

## Appendix C Residual Effects Assessment Criteria

Assessment Criterion	Degree of Residual Effect		
	Low	Moderate	High
Intensity	<p><b>Human health:</b> affects a small number of people and may be indistinguishable from the normal condition or natural variability of the component.</p> <p><b>Components of the natural environment</b><sup>78</sup>: the impact adversely alters the component in a manner that is likely to lead to a slight change in its quality, abundance or general distribution in the local study area.</p> <p><b>Use of lands and resources for traditional purposes:</b> affects few users of land and resources, and/or no sites valued by the community, and has no impact on the community's ability to maintain its traditional lifestyle.</p>	<p><b>Human health:</b> the effect can be detected in a population, but falls within the normal range of variability or complies with standards and regulatory objectives.</p> <p><b>Components of the natural environment:</b> the impact alters the component in a manner that is likely to change its quality, abundance or general distribution in the local study area, without compromising its integrity.</p> <p><b>Use of lands and resources for traditional purposes:</b> affects some users of land and resources with regard to one or more activities, and/or one or more sites valued by the community; does not compromise the community's ability to continue its traditional way of life.</p>	<p><b>Human health:</b> the effect causes clear and sustained exceedances of the regulatory standards and objectives.</p> <p><b>Components of the natural environment:</b> the impact destroys the component or alters the component's integrity in a manner that is likely to significantly change its quality, abundance or general distribution and cause its decline in the local study area.</p> <p><b>Use of lands and resources for traditional purposes:</b> affects the majority of users of land and resources with respect to many activities, and/or affects a number of sites valued by the community and/or compromises the community's ability to continue its traditional way of life.</p>
Extent	Isolated	Local	Regional
<p>The extent refers to the geographic scope of the impact and/or the number of people who will be affected.</p>	<p>Where the extent of the impact is isolated, the disturbance is circumscribed and affects a small portion of the local study area or an area used by only a few individuals.</p>	<p>Where the extent is local, the disturbance affects an area extending to the boundaries of the local study area, or affects a number of individuals or groups of individuals.</p>	<p>Where the extent is regional, the disturbance affects a large area (e.g. the Matimek controlled harvest zone) or whole communities (e.g. the municipality of Sept-Îles or the Uashat Mak Mani-Utenam community).</p>

<sup>78</sup> Includes the following valued components: water resources, birds and their habitat, fish and fish habitat, and terrestrial wildlife and its habitat.

Assessment Criterion	Degree of Residual Effect		
Duration	Short	Medium	Long
The duration of the effect concerns the temporal extent of the impact, i.e. the period of time during which the valued component will be affected.	The duration ranges from a few days to the entire construction period, including the first few months of the operation phase.	The effect persists for several months after the end of construction work, but lasts less than 5 years.	The effect persists on a continuous or discontinuous basis for more than 5 years. This may be a permanent and irreversible effect.

The significance of the effect encompasses the criteria of intensity, extent and duration. The combinations used to determine the level of significance of the effect are pre-established. The relationships among the criteria, as presented on the following page, allow an overall judgement to be made on the significance of the effect according to a three-point scale: high, medium and low.

Effects at the high level are considered significant, whereas effects at the moderate and low levels are considered not significant.

Appendix D

**Grid for evaluating the significance of environmental effects**

Intensity	Extent	Duration	Significance
High	Regional	Long	High
		Medium	High
		Short	Medium
	Local	Long	High
		Medium	High
		Short	Medium
	Isolated	Long	Medium
		Medium	Medium
		Short	Low
Medium	Regional	Long	High
		Medium	High
		Short	Medium
	Local	Long	High
		Medium	Medium
		Short	Medium
	Isolated	Long	Medium
		Medium	Low
		Short	Low
Low	Regional	Long	Medium
		Medium	Medium
		Short	Low
	Local	Long	Medium
		Medium	Medium
		Short	Low
	Isolated	Long	Low
		Medium	Low
		Short	Low

A medium intensity impact with a local extent and short duration is an effect whose importance is considered of medium significance

## Appendix E Summary of Environmental Effects of the Project

Based on the analysis of the environmental effects of the Project and presented in Chapter 7.

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
Human health	Transportation and traffic Blasting Borrow pits Use of machinery Plant and concentrator Tailings pond, waste rock pile and overburden dump	Health effects from atmospheric emissions	1-3	No exceedance of standards is anticipated. A small number of residents living near the mine site could be exposed throughout the life of the mine to air contaminants and noise from mining activities, particularly during the eight years when the mine will be operating at full capacity.	Medium	Isolated	Long	Medium
	Transportation and traffic Use of machinery Blasting Plant and concentrator	Greenhouse gas emissions	4-8	Over the life of the project, the greenhouse gas emissions are estimated at 885,000 tonnes CO <sub>2</sub> eq with most of this amount due to diesel fuel consumption by mobile equipment.	Low	Regional	Long	Medium
	Use of machinery, Transportation and traffic	Health effects from noise (stress, nuisance, sleep disturbance)	9-17	No exceedance of the criteria in Directive 019 is anticipated. In addition, the change in the percentage of people highly annoyed by project-generated	Medium	Isolated	Long	Medium

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
	Blasting			noise should be lower than 6.5%. A small number of residents living near the mine site could be exposed to noise from mining activities throughout the life of the mine, particularly during the construction phase and the operations phase until the screening mound has been installed.				
	Transportation and traffic Blasting Borrow pits Use of machinery Plant and concentrator Tailings pond, waste rock pile and overburden dump Water management	Contamination of drinking water	1-3; 18,19,27,34	No residual effects are anticipated.	-	-	-	-



Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
Water resources	Tailings pond, waste rock pile and overburden dump Effluent Water management Site preparation Transportation and traffic Use of machinery Blasting Stream crossing	Contamination of surface water and groundwater by sediment inputs, leacheates, saline intrusion, ammonium nitrate, petroleum products	18-23; 25-32; 61-67	Water management at the mine site will help to limit contamination of water resources significantly. The receiving environment for mine effluent (Clet Creek and Sept Îles Bay) would nonetheless be affected by inputs of contaminants (metals, nutrients, suspended particulates) throughout the operations phase, in spite of compliance with the requirements of the <i>Metal Mining Effluent Regulations</i> and Directive 019.  The risk of contamination associated with a spill of petroleum products is limited and the magnitude of the risk is small as well.  A temporary and small influx of sediment could occur in some watercourses.	Low	Local	Long	Medium
	Site preparation	Loss of water bodies and streams due to encroachment/drainage and alteration of water inflows	35	Three lakes (PE-1, PE-2, PE-3) would disappear permanently, as would several sections of streams.	Low	Isolated	Long	Low
	Extraction – pit Water	Drop in the water levels in lakes and streams in the	24, 33, 34	The flows and water levels in lakes and streams in the Project's zone of influence would decrease owing	Low	Local	Long	Medium

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
	management, Dikes Drainage ditches Disposal of mine waste	Project's zone of influence		to the combined drop in inflows from groundwater and surface water. The anticipated decrease in the flow from several streams on the study site would range from -85% for stream R9 to -5% for the Hall River.				
Fish and fish habitat	Site preparation Transportation and traffic Use of machinery Stream crossing	Disruption of fish spawning caused by fine sediment inputs	36,39,40	Mitigation measures would prevent or significantly reduce sediment inputs and associated effects on fish	Low	Isolated	Short	Low
	Site preparation	Permanent loss of fish habitat through encroachment/drainage, and alteration of water inflows	35	Fish habitat losses are estimated at 8.5 ha. Compensation will be provided for the losses.	Low	Isolated	Long	Low

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
	Water management	Mining effluent could affect eelgrass beds and the aquatic resources they harbour	38	Mine water will be treated to ensure that the effluent does not have significant effects in the short or medium term on Sept îles Bay, eelgrass and aquatic resources that frequent the bay. Uncertainty remains with regard to the long-term effects, and monitoring is required.	Low	Local	Long	Medium
	Blasting	Fish mortality	37	No residual effects are anticipated.	-	-	-	-
Birds and their habitat	Tree clearing Excavation and earthwork Site preparation	Habitat loss and deterioration	50, 51, 55	The loss of about 1,285 ha of terrestrial and aquatic habitat will cause disturbance to several hundred breeding pairs, including a few olive-sided flycatcher and common nighthawk pairs. Given the abundance of similar habitat in the Project region, the bird populations are likely to successfully establish elsewhere. Gradual restoration of the mine site will limit the duration of the effect.	Medium	Isolated	Long	Medium

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
	Use of machinery, Transportation and traffic Blasting	Disturbance of birds caused by changes in the noise environment	56	The noise and comings and goings associated with construction, development and operation activities could disturb birds and cause behavioural changes that could affect feeding and reproduction.	Low	Isolated	Long	Low
	Water and tailings management	Contamination and/or mortality of birds caused by contact with the water in the impoundment area.	58	No residual effects are anticipated.	-	--	-	-
	Tree clearing and site preparation	Disruption of bird breeding and embryo mortality associated with nest destruction	52 – 55; 57	Despite the application of mitigation measures, a few bird nests could be destroyed.	Low	Isolated	Short	Low
Terrestrial wildlife and its habitat	Tree clearing Excavation and earthwork Site preparation	Habitat loss and deterioration	41 – 46;	Losses of about 1,285 ha of suitable habitats, which corresponds to roughly 6.4% of the local study area. These losses will cause disturbance to terrestrial wildlife at the mine site, which will be forced to move to similar habitats in the region. Some individuals of species with low mobility may be lost.	Medium	Isolated	Long	Medium

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
	Transportation and traffic	Mortality of terrestrial wildlife	49	For certain species, road and rail transport could lead to collision mortality.	Low	Isolated	Long	Low
	Use of machinery, Transportation and traffic Blasting	Disturbance to terrestrial wildlife due to changes in noise environment	48	The noise that is generated may cause disturbance to terrestrial wildlife. Feeding, reproduction and rearing behaviours may be disrupted.	Low	Isolated	Long	Low
Current use of lands and resources for traditional purposes	Tree clearing and site preparation	Loss of areas that are currently used	59	Temporary loss of 2,638.8 ha of the area used and permanent loss of about 167 ha. Based on information provided to the Agency, this area is not used very much and does not contain sites valued by the Innu.	Low	Local	Long	Medium
	Use of machinery, Transportation and traffic	Changes in the noise environment may disturb land users	9 – 17	The noise could disturb individuals who use the land for traditional purposes and could drive away animals that are hunted and trapped in the area, primarily along the shores of Sept Îles Bay, over a distance of 2 to 3 km vis-à-vis the location of the pit, during the construction phase and at the start of mine operations.	Medium	Isolated	Long	Medium

Valued Component	Activities	Potential Effects	Mitigation Measures (refer to Appendix B)	Residual Effects (after mitigation measures)	Degree of Severity of the Adverse Residual Effect			Significance of Residual Effect
					Intensity	Extent	Duration	
	Transportation and traffic Blasting Borrow pits Use of machinery Plant and concentrator Tailings pond, waste rock pile and overburden dump Water management	Risk of contamination of traditional food	59	No residual effects are anticipated	-	-	-	-
	Tree clearing and site preparation	Destruction or damage to an Aboriginal archeological site	60	No residual effects are anticipated	-	-	-	-

## Appendix F

# Summary of the Federal and Provincial Regulatory Framework for Valued Components in the Environmental Assessment

The table below summarizes the provincial and federal framework for each valued component identified in the environmental assessment. To determine the significance of the residual environmental effects of the Arnaud Project, the Agency took into consideration, to the extent possible, all applicable federal and provincial Acts and regulations as well as criteria and/or guidelines.

Valued Component	Canada	Quebec
Water resources	<p>The <b>Metal Mining Effluent Regulations (MMER)</b> apply to all Canadian metal mines (except placer mines) exceeding an effluent flow rate of 50 cubic metres per day at any time after the regulations were registered and that deposit effluent into natural water bodies frequented by fish. The MMER specifies the maximum concentration limits for arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids (TSS), radium-226 and pH in mine effluent (the pH of the effluent must be equal to or greater than 6.0 but not greater than 9.5).</p> <p>Mines subject to the MMER are also required to conduct environmental effects monitoring (EEM) studies in accordance with prescribed criteria. The objective of EEM is to evaluate the effects of mining effluent on the receiving aquatic environment, specifically with regard to effects on fish, fish habitat, and the use of fisheries resources. The substances that must be measured in EEM studies are aluminum, cadmium, iron, mercury, molybdenum, selenium, ammonia and nitrate. <a href="http://laws-lois.justice.gc.ca/eng/regulations/SOR-2002-222/">http://laws-lois.justice.gc.ca/eng/regulations/SOR-2002-222/</a></p> <p><b>Canadian water quality guidelines</b> are intended to provide protection of freshwater and marine life from anthropogenic stressors such as chemical inputs or changes to physical components. Guidelines are numerical concentrations or narrative statements. Ambient water</p>	<p><b>Directive 019 on the mining industry</b> is the tool currently used to analyze mining projects that require a certificate of authorization to be issued under Quebec’s <i>Environment Quality Act</i>. It includes provisions designed to protect surface water and groundwater. With regard to surface water, Directive 019 sets out the allowable concentrations related to mining effluent (e.g. pH, arsenic, copper, iron, nickel, lead, zinc, cyanide, hydrocarbons and suspended solids).</p> <p>To protect groundwater, the operator must, among others, install a groundwater monitoring network around at-risk facilities, except where all the underlying hydrogeological formations are Class III and have no hydraulic connections. <a href="http://www.mddelcc.gouv.qc.ca/milieu_ind/directive019/">http://www.mddelcc.gouv.qc.ca/milieu_ind/directive019/</a></p> <p><b>Environmental discharge objectives</b> are concentrations and loads that can be released into an aquatic environment and that take into account the characteristics of the discharge and the receiving environment, as well as the water quality level necessary to maintain water uses. In the mining sector, proponents are required to comply with the standards (limits) set out in Directive 019, and sometimes, when treatment technology permits, to strive to meet the environmental discharge objectives. The province encourages proponents to consider environmental discharge objectives as continuous improvement targets and to study the proposed environmental discharge objectives with regard to the analytical, economic and technical feasibility related to water treatment.</p>



Valued Component		Canada	Quebec
		<p>quality guidelines developed for the protection of aquatic life provide the science-based benchmark for a nationally consistent level of protection for aquatic life in Canada. <a href="http://cegg-rcqe.ccme.ca/en/index.html#void">http://cegg-rcqe.ccme.ca/en/index.html#void</a></p> <p>The List of Toxic Substances in Schedule 1 of the <i>Canadian Environmental Protection Act</i> (CEPA) includes substances that are considered to be toxic as defined in Section 64 of the Act. The Government of Canada has the authority to regulate and authorize other instruments to prevent or control the use and/or discharge of these substances. Substances are added to Schedule 1 of CEPA by the Government of Canada based on the Ministers of Environment and Health's recommendation. <a href="https://www.ec.gc.ca/toxiques-toxics/default.asp?lang=En&amp;n=98E80CC6-1">https://www.ec.gc.ca/toxiques-toxics/default.asp?lang=En&amp;n=98E80CC6-1</a></p>	<p><a href="http://www.mddelcc.gouv.qc.ca/Eau/oer/index.htm">http://www.mddelcc.gouv.qc.ca/Eau/oer/index.htm</a></p> <p>Quality criteria are established for each contaminant and each water use. The quality criteria for the prevention of contamination of water and aquatic organisms are intended to protect water and aquatic organisms from contamination that could pose a threat to current and future human consumption. <a href="http://www.mddelcc.gouv.qc.ca/Eau/criteres_eau/fondements.htm#s_ante-humaine">http://www.mddelcc.gouv.qc.ca/Eau/criteres_eau/fondements.htm#s_ante-humaine</a></p>
Human health	Air quality	<p><b>Canadian Ambient Air Quality Standards</b> are health-based air quality objectives for pollutant concentrations in outdoor air. These standards relate solely to fine particulate matter and ground-level ozone, two pollutants of concern to human health and the major components of smog. <a href="http://www.ec.gc.ca/default.asp?lang=En&amp;n=56D4043B-1&amp;news=A4B2C28A-2DFB-4BF4-8777-ADF29B4360BD">http://www.ec.gc.ca/default.asp?lang=En&amp;n=56D4043B-1&amp;news=A4B2C28A-2DFB-4BF4-8777-ADF29B4360BD</a></p>	<p><b>Clean Air Regulation and air quality criteria</b></p> <p>The province uses standards and criteria to assess air quality and to study projects generating air contaminant emissions that are submitted to it for authorization. The standards consist of maximum values and are set out in the <i>Clean Air Regulation</i>. Criteria are reference levels used to evaluate emissions of certain contaminants that are not regulated. <a href="http://www.mddelcc.gouv.qc.ca/air/criteres/index.htm">http://www.mddelcc.gouv.qc.ca/air/criteres/index.htm</a></p>
	Greenhouse gases	<p>Any facility with annual greenhouse gas emissions of 50 000 tonnes CO<sub>2</sub> eq. or more is required to report them to Environment Canada's Greenhouse Gas Emissions Reporting Program (refer to section 46 of the <b>Canadian Environmental Protection Act</b>). <a href="http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&amp;n=040E378D-1">http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&amp;n=040E378D-1</a></p>	<p><b>Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere</b></p> <p>Emitters are required to report their GHG emissions. The reporting threshold for GHG emissions is 10,000 tonnes of CO<sub>2</sub> eq. <a href="http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&amp;file=/Q_2/Q2R15_A.htm">http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&amp;file=/Q_2/Q2R15_A.htm</a></p>
	Acoustic environment	<p>Health Canada does not have any noise guidelines or thresholds or enforceable standards.</p>	<p><b>Directive 019 on the mining industry</b> provides that the acoustic level of a fixed source associated with a mining activity must be evaluated</p>

Valued Component		Canada	Quebec
	nt (noise and vibration)	<p>Health Canada's approach to noise assessment is to consider a variety of internationally recognized standards for acoustics, such as CAN/CSA ISO standards. Health Canada considers the following noise-induced endpoints as health effects: noise-induced hearing loss, sleep disturbance, interference with speech comprehension, complaints, and change in percent highly annoyed (%HA).  <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/environ_assess-eval/index-eng.php">http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/environ_assess-eval/index-eng.php</a></p>	<p>in accordance with the provisions in <b>Instruction Note 98-01</b> (handling of noise-related complaints and requirements pertaining to companies causing the noise). Measured noise levels must comply with the requirements in the instruction note.</p> <p>Directive 019 also includes requirements related to vibrations caused by blasting, including maximum vibration velocities as a function of ground vibration.</p> <p><b>Directive 019:</b> <a href="http://www.mddelcc.gouv.qc.ca/milieu_ind/directive019/">http://www.mddelcc.gouv.qc.ca/milieu_ind/directive019/</a></p> <p><b>Instruction Note 98-01:</b>  <a href="http://www.mddelcc.gouv.qc.ca/publications/note-instructions/98-01.htm">http://www.mddelcc.gouv.qc.ca/publications/note-instructions/98-01.htm</a></p>
	Drinking water	<p><b>Guidelines for Canadian Drinking Water Quality</b> are intended to protect the health of the most vulnerable members of society, specifically children and the elderly. The guidelines set out the basic parameters that every water system should strive to achieve in order to provide the cleanest, safest and most reliable drinking water possible. <a href="http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php">http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php</a></p>	<p><b>Quality of Drinking Water Regulation</b></p> <p>This regulation sets out water quality standards and controls. Municipal, private, institutional and tourism-related systems providing drinking water for more than 20 people are subject to monitoring of drinking water quality. Operators of drinking water systems have primary responsibility for providing Quebecers with quality drinking water. The province assumes responsibility for regulatory monitoring and issuance of the authorizations required for facilities.  <a href="http://www.mddelcc.gouv.qc.ca/eau/potable/brochure/">http://www.mddelcc.gouv.qc.ca/eau/potable/brochure/</a></p>
Fish and fish habitat		<p>The <b>Fisheries Act</b> is aimed mainly at protecting the productivity of commercial, recreational and Aboriginal fisheries. Section 35 of the Act states that no work, undertaking or activity may be carried out that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery, unless authorization for such purpose is obtained from the Minister of Fisheries and Oceans. All serious harm to fish must be addressed through a fish habitat compensation plan to offset the loss of fish habitat.  <a href="http://laws-lois.justice.gc.ca/eng/acts/F-14/page-">http://laws-lois.justice.gc.ca/eng/acts/F-14/page-</a></p>	<p>The <b>Act respecting the conservation and development of wildlife</b> sets out various prohibitions related to the conservation of wildlife resources as well as various safety measures. It also specifies the rights and obligations of hunters, fishers and trappers. Under section 128.6, it is prohibited to carry out any activity that is likely to modify a biological, physical or chemical element of an animal or fish habitat. However, the Minister may authorize such an activity subject to certain conditions. Wildlife habitats include fish habitats and are defined in the <b>Regulation respecting wildlife habitats</b>.</p>

Valued Component	Canada	Quebec
	<p><a href="#">10.html#docCont</a></p> <p>Furthermore, section 36 of the Act states that “no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish, or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.” The Governor in Council may, however, permit the use of a natural water body frequented by fish for the disposal of mine waste. This requires an amendment to the <b>Metal Mining and Effluent Regulations</b> so that the water body can be added to Schedule 2 thereof. In such a case, the project proponent must develop and implement a fish habitat compensation plan to offset the loss of fish habitat in accordance with section 27.1 of the MMER.</p> <p>Certain fish species are protected under the <b>Species at Risk Act</b> (refer to the section on birds for more details).</p>	<p>In Quebec, eight fish species are designated as vulnerable or threatened within the meaning of the <b>Act respecting threatened or vulnerable species</b>. Twenty-five other species are identified as likely to be designated as threatened or vulnerable (refer to the section on terrestrial wildlife and its habitat for more details concerning this Act).</p> <p><b>Act respecting the conservation and development of wildlife</b>  <a href="http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&amp;file=/C_61_1/C61_1_A.html">http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&amp;file=/C_61_1/C61_1_A.html</a></p> <p><b>Regulation respecting wildlife habitats</b>  <a href="http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&amp;file=/C_61_1/C61_1R18_A.HTM">http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&amp;file=/C_61_1/C61_1R18_A.HTM</a></p>
Terrestrial wildlife and its habitat	<p>The purposes of the <b>Species at Risk Act</b> are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.</p> <p>As part of an environmental assessment carried out under the <b>Canadian Environmental Assessment Act, 2010</b> (the former Act), the Agency is legally bound to address matters pertaining to this Act. The Agency must identify adverse effects of the project on species and their critical habitat, and ensure that measures are taken to avoid or lessen those adverse effects; and to monitor them and ensure that such measures are consistent with any applicable recovery</p>	<p>The <b>Act respecting threatened or vulnerable species</b> applies to threatened or vulnerable plant and animal species designated under the Act which live in Quebec or are imported into Quebec. The Act covers 38 species, of which 20 are designated threatened and 18 as vulnerable. To this is added the list of wildlife species likely to be designated as threatened or vulnerable, which comprises 115 species. Recovery plans are established for threatened and vulnerable species, and committees of experts monitor the implementation of these plans. Once a species is officially designated as “threatened” or “vulnerable,” management and protection of the species falls under the <b>Act respecting the conservation and development of wildlife</b>.</p> <p>The provisions of the <b>Act respecting the conservation and development of wildlife</b> and the <b>Regulation respecting wildlife habitats</b> apply to wildlife and its habitat (see also the section on fish and fish habitat). White-tailed deer yard, areas frequented by caribou,</p>

Valued Component	Canada	Quebec
	<p>strategy and action plans.</p> <p><b>Species at Risk Act</b>  <a href="http://laws-lois.justice.gc.ca/eng/acts/S-15.3/page-9.html">http://laws-lois.justice.gc.ca/eng/acts/S-15.3/page-9.html</a></p> <p><b>Canadian Environmental Assessment Act, 2010</b>  <a href="http://laws-lois.justice.gc.ca/eng/acts/c-15.2/20100712/P1TT3xt3.html">http://laws-lois.justice.gc.ca/eng/acts/c-15.2/20100712/P1TT3xt3.html</a></p>	<p>habitats of a threatened or vulnerable wildlife species, muskrat habitat, salt licks and shelter stands for white-tailed deer are wildlife habitats within the meaning of the <b>Regulation respecting wildlife habitats</b>.</p> <p><b>Act respecting threatened or endangered species</b>  <a href="http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&amp;file=/E_12_01/E12_01_A.htm">http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&amp;file=/E_12_01/E12_01_A.htm</a></p>
Birds and their habitat	<p>In Canada, as many as 658 different species of birds have been identified, including 555 migratory species covered by the <b>Migratory Birds Convention Act, 1994</b>. This Act and its regulations (<b>Migratory Bird Regulations</b> and the <b>Migratory Bird Sanctuary Regulations</b>) provide protection of migratory birds, including the prohibition against disturbing or destroying the nests and eggs of migratory birds. For example, under subsection 5.1 of this Act, it is prohibited to deposit a substance that is harmful to migratory birds in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area.</p> <p>Certain bird species are protected under the <b>Species at Risk Act</b> (refer to the section on terrestrial wildlife and its habitat for more details).</p> <p><b>Migratory Birds Convention Act, 1994</b>  <a href="http://laws-lois.justice.gc.ca/eng/acts/M-7.01/page-2.html">http://laws-lois.justice.gc.ca/eng/acts/M-7.01/page-2.html</a></p> <p><b>Migratory Birds Regulations</b>  <a href="http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._1035/">http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._1035/</a></p>	<p>The provisions of the above-mentioned <b>Act respecting the conservation and development of wildlife</b> and the <b>Regulation respecting wildlife habitats</b> apply to birds and their habitat (see also the section on fish and fish habitat). Cliffs inhabited by a colony of birds, the habitat of a threatened or vulnerable wildlife species, heronries, and islands or peninsulas inhabited by a colony of birds are habitats within the meaning of the <b>Regulation respecting wildlife habitats</b>.</p>

Valued Component	Canada	Quebec
	<p><b><i>Migratory Bird Sanctuary Regulations</i></b>  <a href="http://lois-laws.justice.gc.ca/eng/regulations/C.R.C.%2C_c.1036/">http://lois-laws.justice.gc.ca/eng/regulations/C.R.C.%2C_c.1036/</a></p>	
<p>Current use of lands for traditional purposes</p>		<p>Research on/discovery of archeological sites is governed by the Quebec <b><i>Cultural Property Act</i></b>. The Act provides that legal protection is accorded to “recognized” and “classified” archeological sites. It specifies that no person may alter, restore, repair, change in any manner or demolish all or part of any recognized cultural property or any classified cultural property.  <a href="http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&amp;file=/B_4/B4_A.html">http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&amp;file=/B_4/B4_A.html</a></p>

## Appendix G Concerns raised by Aboriginal Groups

The following table presents the concerns raised by Aboriginal groups through consultations held in support of the environmental assessment of the Arnaud mining project.

### List of abbreviations:

UM: Innu TakuaiKAN Uashat Mak Mani-Utenam

MLJ: Matimekush-Lac John

### Summary of concerns raised by Aboriginal groups

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
UM, MLJ	Rights	<p><b># 1</b> The Innu of UM-MLJ assert Aboriginal rights, including Aboriginal title, and other rights on their entire traditional territory (Nitassinan), including its natural resources, and they are opposed to any development projects in their traditional territory without their consent. The Innu of UM-MLJ dispute the authority of the provincial and federal governments to authorize development projects in their Nitassinan. The Project would have a serious adverse effect on the rights of the Innu.</p>	Question addressed to the Crown	<p>The Agency has developed a flexible approach which incorporates Crown consultations with Aboriginal groups in the environmental assessment process. The federal environmental assessment is not intended to establish Aboriginal rights or titles.</p> <p>Throughout the environmental assessment, the Agency took into account the anticipated impacts on the potential rights of the Innu of UM-MLJ, including the title claimed. The mitigation measures detailed in the report concerning human health, water resources, fish, progressive restoration of the site, and use of the area are measures which minimize the potential impacts of the Project on the rights and title claimed by ITUM.</p> <p>The offer of consultation was amended by adding a period of comments on the draft comprehensive study report.</p> <p>Depending on the decision of the Minister of the</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				<p>Environment, Fisheries and Oceans Canada may decide to issue authorizations under the <i>Fisheries Act</i>. Where applicable, Aboriginal groups would have the opportunity to review and comment on the conditions included in the federal authorizations.</p> <p>Environment Canada also plans to conduct consultations, during the regulatory phase, concerning the decision of the Governor in Council to amend the <i>Metal Mining Effluent Regulations</i> to authorize the deposit or discharge of deleterious substances in a water body frequented by fish, by adding water bodies to Schedule 2 of the <i>Metal Mining Effluent Regulations</i> such as tailings impoundment areas in accordance with paragraphs 36(5) (a) to (e) of the <i>Fisheries Act</i>.</p>
UM, MLJ	Water quality	<p><b># 2</b> Potential that the mining effluent may not be adequately treated before being discharged into Clet Creek, thereby leading to contamination and eutrophication of the bay owing to phosphorus, nitrogen and toxic metals. The proponent already admits that it may not meet the standards concerning phosphorus, not to mention that it is far from certain that these standards are adequate.</p>	<p>Concerning mine effluent, the proponent notes that it has adopted an approach which prevents impacts by controlling them at the source. The proponent will implement a water management system which will ensure that the mine wastewater will be collected and treated before being discharged into Clet Creek. This water will have to meet the standards of the <i>Metal Mining Effluent Regulations</i> and the criteria of provincial Directive 019 as well as the specific standards on suspended sediment and phosphorus imposed by the province. The proponent agrees to take steps to ensure that the concentrations of deleterious substances contained in the effluent comply insofar as possible with the provincial effluent discharge objectives. These objectives are very similar to the criteria for the protection of aquatic life. The proponent does not anticipate any impact of the</p>	<p>The proponent will implement a water management system to ensure compliance with standards of the <i>Metal Mining Effluent Regulations</i> and the criteria of provincial Directive and to comply insofar as possible with the provincial effluent discharge objectives. The specific standards imposed by the province for total suspended sediment and phosphorus will significantly reduce the levels of metals in the effluent and prevent eutrophication of the bay in the short and medium term. Given the geochemical characteristics of the mine waste and the water management plan proposed by the proponent, the Agency is of the opinion that the residual effects of the Project on water quality will be low in the short and medium term.</p> <p>However, the Agency is of the opinion that the effluent would contain substances which, even if they met the applicable federal and provincial standards and requirements, could pose a risk of adversely affecting fish and fish habitat over the long</p>



Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
			effluent in Sept-Îles Bay.	term, and particularly the eelgrass bed located around the mouth of Clet Creek. Consequently, the proponent must model the zone of influence of the mining effluent plume in Sept-Îles Bay and must characterize the current state of the eelgrass bed in the area around the mouth of Clet Creek before the damming of this creek. In addition, the proponent must conduct long-term monitoring of the effects of the discharge of mining effluent in this area of Sept-Îles Bay. See Chapters 7.4 and 8 for more details.
UM, MLJ	Water quality	<p><b># 3</b> Potential for contamination of the bay, in particular by subsurface seepage from the tailings cells and the absorption of toxic dust by the bay.</p> <p>Additional drilling to obtain core samples to accurately characterize the permeability of the soils underlying the tailings sites would be necessary before any authorization of the Project in order to better verify and control contamination of groundwater under the accumulation areas.</p>	<p>The percolation rates that were estimated under a section of the tailings site meet the requirements of provincial Directive 019. Additional drilling to obtain samples will be carried out when Mine Arnaud submits the application for a certificate of authorization for construction of the tailings site in order to demonstrate the impermeability of the underlying soils/bedrock in other parts of the tailings site. Considering the percolation rates estimated, the proponent does not anticipate any significant degradation of the quality of the groundwater, water which could eventually resurface in the bay.</p> <p>The proponent will monitor the quality of groundwater at the site. The monitoring results will be presented in the form of a report and submitted to the departments concerned as well as to the population through the consultation and monitoring committee.</p> <p>With respect to the dust issue, the atmospheric modelling has demonstrated that, with the mitigation measures in place, air quality standards would be met.</p>	<p>Concerning the risk of contamination by groundwater, the Agency is satisfied with the proponent's response because it has undertaken to implement a groundwater monitoring program in order to prevent any contamination of the bay by groundwater. Directive 019 on the mining industry specifies whether impermeability measures are necessary based on the levels of permeability of the soils and the nature of the tailings. The proponent must take the necessary steps in any case where the permeability of the soil under the planned accumulation areas does not meet the requirements of this directive.</p> <p>Concerning the impacts caused by dust, on the basis of the atmospheric modelling of dust dispersion presented by the proponent, the Agency does not anticipate any significant adverse effects in the Sept-Îles Bay.</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
			<p>It should be noted that this dust is mainly composed of iron (approximately 85%). There are no "toxic substances" such as nickel or lead in significant concentrations in this dust.</p>	
UM	Water quality	<p><b># 4</b> Concerns about accumulation of sediments in the bay.</p>	<p>The proponent notes that the mining effluent which will be discharged into Clet Creek will have first been treated in order, among other things, to reduce suspended sediment concentrations to environmentally acceptable levels. The proponent will monitor the sediments in the bay at the mouth of Clet Creek.</p>	<p>The Agency is satisfied with the proponent's response because it has undertaken to conduct monitoring of sediments at the mouth of Clet Creek in the bay. The province has imposed a stricter standard for discharge of total suspended sediment (10 mg/L) than the usual standard of Directive 019 (15 mg/L). Sediment monitoring has been required by the province.</p> <p>As part of the federal follow-up program, the proponent will be asked to take additional measurements, including turbidity, sedimentation rate and characterization of sediment quality at stations in the stream and the bay (mouth) in reference areas monitored and identified for purposes of comparison and interpretation.</p>
UM	Water quality	<p><b># 5</b> Concern about possible discoloration of the water by copper or appearance of "red water" phenomenon.</p>	<p>The proponent points out that no concentration of iron ore or copper ore will take place on the mine property. The iron present in the rock is associated with magnetite. This is not free iron which could be oxidized and generate red water by being leached. There is therefore no reason why this phenomenon should appear in the waters surrounding the site, as can occur near the facilities of iron mines (or pellet plants) where solid iron that can be oxidized is present. Red water from the copper concentration process is caused in particular by the use of acids on the ore. Our process does not use acids</p>	<p>The Agency is satisfied with the proponent's response which specifies:</p> <ul style="list-style-type: none"> <li>•the type of rock at the site and its composition;</li> <li>•that there will be no processing or treatment of iron on site (storage);</li> <li>•the use of a settling basin;</li> <li>•a mine water treatment system prior to discharge into the effluent.</li> </ul>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
			<p>that can attack chalcopyrite and this copper ore is not present in our rock.</p> <p>In addition, peripheral ditches will collect all the water that has been in contact with the infrastructures and will direct the water to the sedimentation pond, where the water will undergo an initial treatment which will eliminate part of the suspended sediment present, including particles of iron. The water will then be directed to the wastewater treatment plant to complete its treatment before being discharged into the final effluent. The treated water will meet environmental discharge standards and will not be red.</p>	
UM, MLJ	Health	<p><b># 6</b> Potential that residents of Uashat and Sept-Îles will breathe in toxic dust.</p>	<p>There will be no atmospheric emissions of toxic dust by the Project in the inhabited areas of Uashat and of the municipality of Sept-Îles. The toxicological study for human health demonstrated that the Project did not pose any significant risk to human health for the residents of Arnaud Township, who are the closest to the mine, or to those living further away in Place Ferland, Uashat or the municipality of Sept-Îles.</p> <p>Air sampling stations will be installed at the boundaries of the mine property in order to ensure compliance with the standards of the <i>Clean Air Regulation</i>. The monitoring results will be presented in the form of a report and submitted to the departments concerned as well as to the population through the consultation and monitoring committee.</p>	<p>Strict application of the mitigation measures by the proponent as well as its commitment not to increase the rate of extraction to more than 75,000 tonnes/day ensure that the atmospheric emissions emitted by the Project are not likely to cause significant effects on human health for the communities of Uashat mak Mani-Utenam and Matimekush-Lac John, and for the population of Sept-Îles.</p> <p>The Federal Committee considers that an air quality monitoring program will be necessary during all phases of the Project. Implementation of the monitoring program will make it possible to verify the predictions of the modelling and to take timely action to prevent any levels exceeding the regulatory standards. Temporary suspension of the transport of waste rock is a measure that the proponent has agreed to implement in such a situation. The monitoring will make it possible, if necessary, to ensure that additional mitigation measures are</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				instituted in order to protect health.
UM	Health	<b># 7</b> Request for air quality monitoring measures in Uashat.	<p>Air sampling stations will be installed at the boundaries of the mine property in order to ensure compliance with the standards of the <i>Clean Air Regulation</i> in Arnaud Township.</p> <p>The province installed an air sampling station in 2014 in Parc Ferland in order to monitor air quality over a one-year period. A report will follow this sampling period.</p>	<p>Air quality measuring stations will be installed by the proponent near homes in Arnaud Township, the neighbourhood most exposed to the atmospheric emissions emitted by mine activities. The Agency is of the opinion that these emissions are not likely to cause any significant risk to human health for the community of Uashat mak Mani-Utenam, which is located 6 km from the mine. The Agency is satisfied with the proponent's commitment.</p> <p>The proponent has agreed that air quality monitoring results be presented in the form of a report and submitted to the consultation and monitoring committee in which Uashat mak Mani-Utenam participates.</p>
UM, MLJ	Health	<b># 8</b> Potential contamination of drinking water in Uashat and Sept-Îles.	<p>Uashat is supplied with drinking water by the water supply system of the municipality of Sept-Îles. The drinking water intake is located in des Rapides Lake. As noted in the report of the Bureau d'audiences publiques sur l'environnement, the proponent has demonstrated that the Project would not have any impact on the water quality of des Rapides Lake.</p>	<p>Des Rapides Lake drinking water source would not be contaminated by the flow of surface water from the mining site since the lake is located in a different watershed from the one in which the Project is located. It is unlikely that des Rapides Lake will be contaminated through groundwater since the network of faults identified and groundwater flow do not indicate potential connectivity in the direction of des Rapides Lake, which is located 6 km to the northeast of the centre of the pit. It is unlikely that the atmospheric emissions related to the Project will have an impact on the water quality of des Rapides Lake, even for the maximum concentrations calculated under the weather conditions most unfavourable to dispersion (modelling of atmospheric dispersion of contaminants).</p>
UM, MLJ	Health	<b># 9</b> Potential impact of noise on the residents of Uashat and Sept-Îles.	<p>The noise modelling concludes that, taking the mitigation measures into account, including the presence of the screening mound, the noise levels will meet the</p>	<p>The Agency is satisfied with the proponent's response. In fact, taking the application of the mitigation measures into account and given the distance separating Uashat from the Project, it is</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
			<p>standards of Directive 019 during mine operation and will meet the standards applicable to construction sites during the construction phase, at the closest homes in Arnaud Township. It is unlikely that impacts (levels exceeding the standards) would be felt in Uashat and Sept-Îles, which are located more than 7 km from the mining site. Mine Arnaud will monitor sound levels for the full duration of the project. The monitoring results will be presented in the form of a report and submitted to the departments concerned as well as to the population through the consultation and monitoring committee.</p>	<p>unlikely that the level of noise caused by the construction or operation of the mining site would cause impacts on community residents.</p>
UM, MLJ	Cumulative effects	<p><b># 10</b> The Innu of UM-MLJ consider that they are already exposed to significant impacts on their health, their local environment and their way of life caused by all the industrial activity in Sept-Îles Bay region. UM-MLJ are not willing to accept an increase in these impacts following the development of the project, including its potential cumulative impacts.</p>	<p>Mine Arnaud deals with the cumulative effects on air quality, moose and species at risk in its environmental impact statement and it considers that these effects will be low. Furthermore, the proponent considers that the health and environment of the residents of Uashat and Matimekush-Lac John will be preserved by the mitigation measures that will be implemented to meet the standards.</p> <p>The proponent does not anticipate that the Project will result in any residual effect on the bay and therefore did not take this into account in the cumulative effects analysis. However, the proponent indicates that it is willing, as a business based in the region and as a future user of the Port of Sept-Îles, to participate in initiatives that may be proposed by groups in the region to study the impacts of human activities on the Sept-Îles Bay.</p>	<p>The Agency addresses concerns about health, way of life and the local environment in this table. Concerns about human health are addressed in lines 6 to 9. The concerns about way of life and the local environment are addressed in lines 13 to 23.</p> <p>Otherwise, the Agency assessed the effects of the cumulative impacts presented by the proponent on air quality, moose and species at risk. Taking into account the good ambient air quality in Sept-Îles and the distance of the various sources of atmospheric emissions from the mine site, the Agency concludes that the cumulative effect of the Project on air quality is low. The moose population in Côte-Nord is stable and healthy and its habitats are abundant in the region. The cumulative effects on the species are deemed low. The Agency considers that the cumulative effect on species at risk is likely to be low during the construction and operation phases, since it would be of limited duration and low intensity considering the wide availability of similar habitats in the region where the Project is located. In addition, the cumulative effect over the longer term would be</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				negligible in view of the planned mitigation measures and the restoration of the mining site.
UM	Cumulative effects	<b># 11</b> The guidelines are not sufficiently specific regarding the implementation of a study on the cumulative effects of the Project by the proponent. The Project has a cumulative impact on the use of the lands and maintenance of the Innu way of life. The temporal scope should be 50 years and the geographic scope should cover all of Nitassinan.	This question is addressed to the Agency	The scope as described by UM exceeds the requirements that can be considered in the context of the assessment of a single Project. Policy decisions concerning territorial organization fall within provincial jurisdiction.
UM, MLJ	Consultation process	<b># 12</b> To date, the Innu of UM-MLJ have not benefitted from any form of accommodation on the part of governments relating to the Project or even minimal consultation. The consultation has mainly taken the form of communication of information. In fact, given the significant potential impacts of the Project, it is far from certain that there would be satisfactory accommodation relating to the Project apart from its rejection, at least given the way that the Project has been designed and presented to date.	Question addressed to the Agency	The Agency considers that the mitigation measures intended to reduce the environmental effects are in fact accommodations concerning the impacts of the Project on the established or potential rights of the Innu communities. These measures concern in particular human health, water resources, wildlife, fish and use of the area. On the basis of these measures, the Agency concludes that the potential adverse effects of the Project on Aboriginal rights and on potential title will be satisfactorily avoided or mitigated.
UM, MLJ	Use of the area	<b># 13</b> The Project would certainly deprive the Innu of UM-MLJ of the enjoyment of part of their Nitassinan, owing to the reduction of the lands and	There will be a change in use of part of the territory for the duration of the Project which affects approximately 1,285 ha. Of this area, 1,118 ha will be restored during and after the Project, thus leaving 167 ha	The Agency considers that there will be residual environmental effects, in particular relating to the 167 ha within the lands used for traditional purposes that will be permanently lost in part of the local study area (area of the pit). However, the Agency

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
		<p>natural resources available to maintain their traditional way of life. There will be a loss or degradation of camp sites and of places of cultural and spiritual importance. There will be impacts on the Innu way of life and on the transmission of traditional knowledge, culture and language.</p>	<p>of permanent loss, mainly associated with the pit itself. However, it will be possible to reduce this loss if fish are introduced into the pit, which will then become a fish habitat.</p> <p>The Project will not affect the traditional activities that may take place in Sept-Îles Bay or its islands and coastline.</p>	<p>notes that the majority of the areas will be only temporarily lost (87% restored). The Agency is of the opinion that these losses of use of the territory will not compromise the use of the lands for traditional purposes and will have a minor impact on the continuity of the way of life of the Innu Nations of Uashat mak Mani-Utenam and Matimekush-Lac John.</p> <p>The impacts of the Project on the coastline of Sept-Îles Bay and on the bay itself will be low and should not hinder the practice of traditional activities by the Innu communities.</p>
UM, MLJ	Use of the area	<p><b># 14</b> Implementation of the Project will have significant adverse cultural, spiritual, social, community and economic consequences on the way of life of the Innu of UM-MLJ. The Project will irreparably and irremediably transform the natural environment of the traditional lands of the Innu of UM-MLJ. The spiritual link with part of the land would be broken and there would be a reduction in the consumption of traditional meat, and a loss of traditional knowledge as well as of the places for teaching that knowledge.</p>	<p>There will be a change in use of part of the territory for the duration of the Project which affects approximately 1,285 ha. Of this area, 1,118 ha will be restored during and after the project, thus leaving 167 ha of permanent loss, mainly associated with the pit itself. However, it will be possible to reduce this loss if fish are introduced into the pit, which will then become a fish habitat. The site of the mining Project is not located on any family trapping lot belonging to members of the communities of Uashat or Matimekush-Lac John.</p> <p>The Project will not affect the traditional activities that may take place in the Sept-Îles Bay or its islands and coastline.</p>	<p>The Agency considers that there will be residual environmental effects, in particular relating to the 167 ha within the lands used for traditional purposes that will be permanently lost in part of the local study area (area of the pit). However, the Agency notes that the majority of the areas will be only temporarily lost (87% restored). The Agency is of the opinion that these losses of use of the territory will not compromise the use of the lands for traditional purposes and will have a minor impact on the continuity of the way of life of the Innu Nations of Uashat mak Mani-Utenam and Matimekush-Lac John.</p> <p>The impacts of the Project on the coastline of the Sept-Îles Bay should be low and should not hinder the practice of traditional activities by the Innu communities.</p>



Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
UM, MLJ	Use of the area	<p><b># 15</b> Losses and degradation of migratory bird (waterbird) hunting areas, specifically in the area of the coastline, the bay and the islands. The section between Hall River and the Rivière des Rapides is identified as one of these areas. In addition, the environmental impact statement does not address the effect of blasting on Canada Geese and other waterfowl.</p>	<p>The traditional migratory bird hunting activities take place mainly on the bay and its banks and not on the site of the Mining Project. The Project will not affect the traditional activities that may take place in the Sept-Îles Bay or its islands and coastline. The Mining Project site is not an area used by Canada Geese or other waterfowl species. These species are present in the spring or in the fall mainly in Sept-Îles Bay and along its banks. Based on observations carried out in other mining operations, Canada Geese and the other waterfowl species are not affected by blasting noise. These birds are concerned by the presence of predators rather than by noise or a sudden detonation.</p>	<p>Although there would be daily blasting in the pit throughout the operation of the mine, the Federal Committee considers that waterbirds will not experience any significant impacts in view of the distance of the mine site from the bay and the sites of interest. In addition, the proponent will build a screening mound and will implement several other measures to mitigate the impacts of the Project on air quality, the acoustic environment and vibrations.</p> <p>The Agency considers that disturbance of the acoustic environment could inconvenience users of the area in the practice of waterfowl hunting. However, the Agency notes that this disturbance would be limited in space (2 to 3 km section along the coastline of Sept-Îles Bay) and in time, i.e. until construction of the screening mound is completed (fifth year of the operation phase).</p>
UM, MLJ	Use of the area	<p><b># 16</b> The environmental impact statement does not address the possibility of contamination of migratory birds by air and water</p>	<p>The toxicological study took into account the consumption of meat of local origin, therefore potentially affected by the Mining Project. The conclusions are to the effect that there is no significant health risk for the communities of Uashat, Sept-Îles and Matimekush-Lac John.</p> <p>Concerning the mine effluent, the proponent points out that it has adopted an approach which prevents impacts by controlling them at the source. The proponent aims to achieve concentrations close to the effluent discharge objectives at the effluent discharge point. These objectives are very similar to the criteria for the protection of aquatic life. The proponent does not anticipate any impact</p>	<p>With respect to contamination by air, the Agency considers that the impact of dust on these species is low and that contamination of the flesh is unlikely. This conclusion was reached considering the modelling of the dispersion of atmospheric emissions carried out by the proponent, the location of the sites used by waterfowl as well as the transient presence of migratory bird species at these sites.</p> <p>With respect to contamination by water, in view of the geochemical characteristics of the mine waste and the water management plan proposed by the proponent, the Agency is of the opinion that the residual effects of the Project on water quality will be low. Consequently, these effects would not contaminate the flesh of migratory birds.</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
			<p>on the wildlife that may frequent the sites.</p>	
UM, MLJ	Use of the area	<p><b># 17</b> Loss or major degradation of brook trout fishing sites. The spawning grounds are very sensitive to the sediments that the mine may generate. The rivers and streams of the bay are fishing sites.</p>	<p>The Mining Project site is located within the Matimek harvested controlled zone and this area does not appear to be a favoured site for fishing. Hall Lake further to the north, which is located outside the Project site, appears to be more attractive for fishing.</p> <p>Surveys were carried out in the majority of the watercourses and water bodies affected by the Project. Brook Trout frequent certain water bodies and watercourses, but are not present in all. According to the surveys, there are no spawning grounds within the boundaries of the mining site.</p> <p>Certain water bodies and watercourses will be affected by the Project. The proponent has undertaken to compensate lost fish habitats by redevelopment of spawning grounds and by stocking in appropriate locations. The proponent understands that a high rate of sediments can affect spawning grounds. That is why the mining effluent that will be discharged into Clet Creek will have first been treated in order, among other things, to reduce the suspended sediment concentrations to environmentally acceptable levels.</p>	<p>The potential brook trout spawning grounds located by the proponent are all located downstream of streams R10 and R11 and Gamache Creek, i.e. at a certain distance from the immediate work area. In addition, monitoring of the conditions on these spawning grounds has been made a requirement. The information provided concerning the rivers of the bay (e.g. Hall River and des Rapides River) does not suggest any probable effects on their spawning grounds.</p> <p>During construction, the proponent has agreed to implement a series of sediment control measures in order to prevent discharges of sediments into the aquatic environment beyond the immediate work area.</p> <p>During the mining operations, the planned sediment control measures will significantly reduce sediment loading in the effluent discharged into Clet Creek. A specific standard for suspended solids imposed by the province should reduce the sediment load downstream to levels that do not pose a high risk to the aquatic wildlife of Clet Creek and Sept-Îles Bay. Prior to the damming of Clet Creek, the proponent will determine the sediment accumulation zones in this creek and in Sept-Îles Bay, taking into account the loading from the mining effluent during the period of operation. As part of the federal follow-up program, the proponent will be asked to take additional measurements, including sedimentation rate and characterization of sediment quality at stations in the creek and the bay (mouth).</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				<p>The proponent will develop and implement a compensation plan which will offset the loss of fisheries productivity that will result from this serious harm caused to fish. This compensation plan will be finalized in collaboration with Fisheries and Oceans Canada, and the community of Uashat will be consulted. This plan will be monitored in order to ensure that the prescribed compensation objectives are met.</p>
UM, MLJ	Use of the area	<p><b># 18</b> Loss or major degradation of part of the fishing area for capelin, cod, flounder, lobster and other marine species. The entire region of the bay constitutes a fishing zone.</p> <p>In addition, the issue of contamination by the mining effluent was not addressed in the environmental impact statement; in particular the issue of the contamination of brook trout in the bay and in Hall River, des Rapides River, au Foin River and du Poste River.</p>	<p>The proponent considers that the substances contained in the mining effluent will be at concentrations that are close to the effluent discharge objectives. These objectives are very similar to the criteria for the protection of aquatic life. The proponent does not anticipate any impact on the fish or lobsters that frequent the bay.</p> <p>In view of the application of mitigation measures (water treatment and dust management), the proponent does not anticipate any significant impact on the water bodies and watercourses in the periphery of the site in terms of contamination of brook trout. In addition, the mining effluent that will be discharged into Clet Creek will have first been treated so that the substances that it contains are at environmentally acceptable concentrations.</p>	<p>In view of the water management plan proposed by the proponent, the requirements of the <i>Metal Mining Effluent Regulations</i> and of Directive 019 and the other conditions imposed by the province concerning phosphorus and suspended solids, the Agency considers that the mining effluent is not likely to cause significant effects in the short and medium term on Clet Creek, Sept-Îles Bay, the eelgrass or the aquatic resources that use it.</p> <p>As part of its permit issuing process, Fisheries and Oceans will require that the proponent model the zone of influence of Clet Creek in Sept-Îles Bay and that it characterize the initial state of the eelgrass bed before construction of the dam on Clet Creek. The monitoring of the mining effluent and of its impact on the eelgrass bed around the mouth of Clet Creek (see answer to question 27) will make it possible to determine if effects become evident over the longer term and to take corrective action, where applicable (e.g. improvements to the water treatment system or relocation of the effluent discharge point).</p> <p>In view of the modelling of dust dispersion carried out by the proponent, the Agency does not have any concerns about the impact of dust on fish in Hall</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				River, des Rapides River, au Foin River and du Poste River or in the bay.
UM, MLJ	Use of the area	<b># 19</b> Loss or major degradation of part of the fishing sites for lake whitefish. The Innu harvest this resource in the lakes near the coastline, for example in des Rapides Lake. Concern about the risks of contamination of the species owing to the mine.	<p>Surveys were conducted in the majority of the watercourses and water bodies affected by the Project. Lake whitefish is not present in the lakes on or near the mining site.</p> <p>Certain water bodies and watercourses will be affected by the Mining Project. The proponent has undertaken to compensate lost fish habitats by redeveloping spawning grounds and by stocking in appropriate locations.</p> <p>The proponent considers that the Project will have no impact on the water quality of des Rapides Lake, or any other lake near the coastline, and therefore no impact on fish present in this habitat.</p>	<p>Lake whitefish have not been captured in the aquatic environments where serious harm to fish is likely to occur.</p> <p>In view of the distance between the mine and des Rapides Lake (6 km) and the modelling of dust dispersion carried out by the proponent, the Agency does not have any concerns about the impact of dust on the water quality of des Rapides Lake or the other lakes in the region. No contamination of the lake by surface water runoff is anticipated since the lake is located in a different watershed from the one in which the Project is located. It is unlikely that des Rapides Lake will be contaminated through groundwater since the network of faults identified and groundwater flow do not indicate potential connectivity in the direction of des Rapides Lake, which is located 6 km to the northeast of the centre of the pit.</p>
UM, MLJ	Use of the area	<b># 20</b> Loss or major degradation of part of the beaver trapping area. The entire region of the coastline and the bay constitutes a Beaver trapping area, particularly in the vicinity of Hall River and in des Rapides Lake.	The proponent considers that the Project will have no impact on beaver at the mouths of Hall River and des Rapides river. The Project will not affect the traditional activities that may take place in the Sept-Îles Bay or islands and coastline.	The Agency considers that the impacts of the Project on the coastline of Sept-Îles Bay and on the bay itself will be low and should therefore not hinder the practice of traditional activities by the Innu communities, particularly in the area of Hall River and des Rapides River. In fact, this area would not be directly affected by the mining facilities and, consequently, no direct loss of use of this area and no loss of wildlife habitat is anticipated.
UM, MLJ	Use of the area	<b># 21</b> Loss or major degradation of part of the areas used for wild berry-picking (lingonberry, etc.), gathering of medicinal plants and use of forest resources in the	The toxicological study took into account the consumption of fruits and plants of local origin, therefore potentially affected by the mining Project. The conclusions are to the effect that there is no significant health risk for the communities of Uashat,	The Agency notes that approximately 13% of the 1,285 ha within the lands used for traditional purposes will be permanently lost in part of the local study area (area of the pit). However, the Agency notes that the majority of the areas (87%) will be only temporarily lost owing to the restoration of the

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
		<p>region of the bay.</p> <p>The Innu use the entire region of the bay to fell trees to build homes and make tools as well as for firewood.</p> <p>Contamination of wild berries, plants and gathering areas by dust and mining effluent were not studied in detail.</p>	<p>Sept-Îles and Matimekush-Lac John.</p> <p>Concerning the mine effluent, the proponent stated that it has adopted an approach which prevents impacts by controlling them at the source. The proponent states that it aims to achieve concentrations close to the effluent discharge objectives at the effluent discharge point. These objectives are very similar to the criteria for the protection of aquatic life. The proponent does not anticipate any impact.</p>	<p>mining site.</p> <p>The traditional activities reportedly take place mainly on the coastline of the bay. The Agency considers that the impact of dust on the berries in this area is low based on the modelling of the dispersion of atmospheric emissions carried out by the proponent.</p> <p>The Agency considers that the impacts of the Project on the coastline of the Sept-Îles Bay and on the Bay itself will be low and should therefore not hinder the practice of traditional activities by the Innu communities. In fact, this area would not be directly affected by the mining facilities and, consequently, no direct loss of use of this area is anticipated.</p>
UM, MLJ	Use of the area	<p><b># 22</b> Loss or major degradation of part of the hunting grounds for small game (grouse, hare, porcupine) and furbearers. The Innu hunt this game in the area surrounding the bay. The environmental impact statement does not study the loss of their habitat or the risk of contamination.</p>	<p>The Mining Project site is not located on any family trapping lot belonging to members of the communities of Uashat or Matimekush-Lac John.</p> <p>The traditional activities take place mainly on the bay and its banks and not on the Mining Project site. The Project will not affect the traditional activities that may take place in Sept-Îles Bay or its islands and coastline.</p> <p>The toxicological study took into account the consumption of meat of local origin, therefore potentially affected by the mining project. The proponent's conclusions are to the effect that there is no significant health risk for the communities of Uashat, Sept-Îles and Matimekush-Lac John.</p>	<p>The Agency notes that approximately 87% of the 1,285 ha of potential habitats of terrestrial wildlife that would be lost on account of the mining infrastructures will be progressively restored, which will minimize the duration of the effect of the habitat losses. Given the availability of similar habitats for several species in the periphery of the local study area, the mobility of the majority of the species, the application of the mitigation measures, the mining site restoration plan and the wetland compensation plan, the Agency considers that the survival of the populations of mammals is not threatened by the implementation of the Project and the associated habitat losses.</p> <p>The Agency considers that the impacts of the Project on the coastline of the Sept-Îles Bay and on the bay itself will be low and should therefore not hinder the practice of traditional activities by the Innu communities. In fact, this area would not be directly affected by the mining facilities and, consequently,</p>

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				no direct loss of use of this area and no loss of wildlife habitat is anticipated. The Agency considers that the impact of dust on small game and furbearers in the area of the bay is low, considering the modelling of the dispersion of atmospheric emissions carried out by the proponent.
UM, MLJ	Use of the area	<b># 23</b> Loss or major degradation of part of the woodland caribou hunting grounds in the region of the bay. This species is threatened.	Woodland caribou have never been observed in the Matimek harvested controlled zone within which the Project is located. Caribou appear to avoid industrial developments. There will therefore be no loss or degradation of the hunting grounds for this species caused by the Project.	Although the local study area is located in the potential geographic range of the woodland caribou, the recent occurrences took place approximately 40 km from Sept-Îles. According to the Quebec Department of Forests, Wildlife and Parks, it is possible that Caribou may venture closer to the local study area since this area is part of the species' habitat, but this is a low-quality habitat given the level of disturbance. The probabilities of use decrease with increasing proximity to Sept-Îles. According to this information, it is unlikely that the Project will cause a loss of woodland caribou hunting grounds on the mine site.
UM	Project design	<b># 24</b> Is the possibility of expansion or development of the Project to mine magnetite will be considered in the context of the environmental assessment?	Exploitable magnetite is present mainly on the north wall of the pit. This side is physically limited by the presence of hydroelectric lines. In addition, the magnetite horizon is not large enough to economically justify moving four 735 KV high voltage hydroelectric lines and a fifth 161 KV line. It should also be noted that the iron content of the magnetite on this horizon is low and is not in any case comparable to the operations for which iron is the main ore. No expansion of the pit is therefore anticipated to extract this magnetite and the proponent has no plans to mine it. The titaniferous magnetite which will be deposited in the tailings cells is a by-product generated by the apatite ore concentration process.	The Agency assessed the Arnaud Mine Project according to the information available. Since the proponent does not plan any expansion or development to extract magnetite, these activities were not assessed in the context of the current environmental assessment of the Project. In the event that the proponent was to plan an expansion of the Project or the development of another project, it would have to file a project notice with the Agency so that the Agency can assess the need for the proponent to conduct an environmental assessment of such a project.

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
			The proponent has chosen to store this magnetite by-product separately in order to eventually recover it for re-sale.	
UM	Project design	<b># 25</b> Question concerning the possibility of locating the Project further from Uashat and the bay	The Project is located at the site where the deposit was discovered, as is the case of other mining projects. There is therefore no possibility of relocating it.	The Agency is satisfied with the proponent's response.
UM	Project design	<b># 26</b> Concerns about reinforcing the dikes to contain an additional volume of tailings following the reduction in the number of cells. Risks of a spill.	The bearing capacities of the underlying soils will be assessed before finalizing the design of the dikes so as to ensure that these works comply with high safety factors. If necessary, measures can also be taken to improve the field conditions. These measures may simply involve excavating the portion of soil with low bearing capacity or installing vertical drains in order to drain these soils and facilitate their consolidation. Daily inspections will be carried out on the site facilities, including the dikes, to ensure that any problem is quickly detected.	The Agency is satisfied with the proponent's response. In addition, the Agency notes that the construction of the dikes is an aspect that is under provincial jurisdiction and for which a provincial certificate of authorization will be issued. The work of reinforcing the dikes will have to meet the requirements of Directive 019. This aspect of the Project would be dealt with at the detail engineering phase during the applications for certificates of authorization.
UM	Quality of the analysis	<b># 27</b> Potential contamination of Sept-Îles Bay: how can the effect of the Project on the bay be measured if there has been no characterization of its current state? Request for a complete characterization to determine the effect on the entire the bay.	The proponent considers that the substances contained in the mining effluent will be at concentrations that are close to the effluent discharge objectives. These objectives are very similar to the criteria for the protection of aquatic life. The proponent does not anticipate any impact on the bay. With respect to the hydrodynamic impact of the discharge of effluent on the eelgrass bed, the proponent considers that the anticipated effects would be minor, limited to a strip around the channel of Clet Creek.	In view of the water management plan proposed by the proponent, the requirements of the <i>Metal Mining Effluent Regulations</i> and of Directive 019 and the other conditions imposed by the province concerning phosphorus and suspended solids, the Agency considers that the mining effluent will not cause significant effects in the short and medium term on Clet Creek, Sept-Îles Bay, the eelgrass or the aquatic resources that use it. The Agency considers that a complete characterization of the bay would be excessive in this context. However, the Federal Committee considers that the information available in the documents provided by the proponent is insufficient to draw any conclusions concerning the long-term effects of the discharge of mining effluent

Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
				<p>on Sept-Îles Bay, the eelgrass and the aquatic resources that use it. Consequently, Fisheries and Oceans Canada will require that the proponent model the zone of influence of the mining effluent plume in Sept-Îles Bay and characterize the current state of the eelgrass bed in the area around the mouth of Clet Creek before the damming of this creek as part of the process for issuing its authorization. In addition, the proponent must carry out long-term monitoring of the effects of the discharge of mining effluent in this area of Sept-Îles Bay.</p>
UM	Accidents and mal-functions	# 28 Concern about the possibility of a landslide and soil compaction.	<p>Soil studies will be carried out before construction of infrastructures at the site in order to determine the characteristics of the underlying soils. This work will make it possible to determine whether or not there is a potential for landslides and to conduct stability calculations. If soils of low bearing capacity are encountered at the site of infrastructures, measures will be instituted in order to improve their stability. These measures could include excavation of these soils or the installation of vertical drains in order to drain the soils and thus facilitate their consolidation. These measures will make it possible to increase the bearing capacity of the soils and prevent landslides. All the retention structures will be constructed with very high safety factors in order to reduce the risks of subsidence. In addition, the works will be covered with waste rock to add weight and consolidate the retention structures, thereby increasing the safety factors.</p>	<p>The Agency notes that, in order to effectively respond to the risks of landslide caused by the presence of marine clay layers, the province will impose on the proponent a specific condition requiring that it carry out stabilization work on the banks of Clet Creek in accordance with the requirements of the Quebec Department of Transportation.</p> <p>The proponent has agreed to assess the level of risk of a potential problem of soil compaction due to the drawdown of the water table as part of an inspection program of the homes located near the mine. The proponent will conduct the field surveys necessary to assess the initial state of the soils at the sites of these homes. The proponent will inform the province of any soil compaction problem as soon as it occurs, for the entire period of operation of the mine.</p>



Group	Subject	Comment/Concern	Summary of proponent's response	Agency's response
UM	Accidents and malfunctions	<p># 29 Need to take major accidents (dike failure or runoff) into account in the potential effects of the project as well as extreme weather events caused by climate change</p> <p>Lack of confidence in the industry self-regulation system concerning the prevention of accidents and malfunctions. Opinion that the government is failing to exercise adequate control. UM considers the risk of a spill unacceptable.</p>	<p>The proponent took accidents and malfunctions and the effects of climate change into account in the design of its Project, as stipulated in its environmental impact statement and supplementary documents.</p>	<p>The Comprehensive Study Report assessed the potential impacts of accidents and malfunctions as well as the impacts of the environment on the Project. The proponent has agreed to take into account in the design of its Project the consequences associated with climate change, as set out in the document prepared by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment.</p> <p>In addition to regular monitoring, visual inspections will also be carried out following any event that might affect the stability of the works.</p> <p>The Agency is of the opinion that the proponent has identified and assessed the potential accidents and malfunctions related to the Project. The Agency notes that the Project was designed to prevent such incidents and that an emergency plan and a risk management program will be developed in order to manage these situations, where applicable.</p>

## Appendix H Methodology for Estimating and Assessing Risks and Summary of Technology Risks

This appendix is based on the proponent’s environmental impact statement and presents the methodology for estimating and assessing the environmental risks associated with potential accidents and malfunctions, as well as the summary of technology risks.

### a) Methodology for estimating and assessing risks

Criteria taking into account the severity of consequences of incidents, the probability of occurrence of such events and the level of uncertainty related to the consequences and the associated probability were used for estimation and assessment.

These criteria are listed in the subsections, tables and figures below:

1. Risk matrix;
2. Level of severity of consequences;
3. Class of probability of occurrence;
4. Level of uncertainty related to the level of severity of consequences and the associated probability; and
5. Level of risk.

The level of risk that is identified takes into account the existing prevention and mitigation measures provided that these measures are robust and reliable.

#### 1. Risk matrix

<b>Severity of consequences</b>	Very high	Medium	High	Very high	Very high	Very high
	High	Medium	Medium	High	Very high	Very high
	Medium	Low	Medium	Medium	High	Very high
	Low	Low	Low	Medium	Medium	High
	Very low	Very low	Low	Low	Medium	Medium
		Very low	Low	Medium	High	Very high
		<b>Probability of occurrence</b>				

The levels of severity are described in Table 2 and cover the following elements:

- workers/public: health and safety of people in the area at the time of the incident;
- environment: impact on the environment; and
- property: property damage, interruption of production.

**2. Levels of severity of consequences**

Severity of consequences	Workers/Public	Environment	Property
Very high	Several fatalities caused by direct exposure.	Major spill of hazardous material that was not contained; mortality of organisms on a regional basis; contamination of aquifer and drinking water.	Major property damage making the buildings unusable, interruption of production for 1 month.
High	Loss of life caused by direct exposure.	Major spill of hazardous material that was not contained; mortality of organisms on a regional basis; contamination of aquifer and drinking water.	Major property damage making the buildings unusable, interruption of production for 1 week.
Medium	Injuries; serious diseases.	Minor spill of hazardous material that was not contained; mortality of organisms on a local basis; contamination of specific drinking water wells.	Considerable damage, interruption of production for 1 week.
Low	Injuries and diseases not causing disability; major deterioration of quality of life; non-serious illness.	Major spill of hazardous material that has been contained; a portion of local organisms subject to a negative impact.	Minor damage, interruption of production for one day.
Very low	Slight impact on quality of life.	Minor spill of hazardous material that has been contained; No measurable impact in the area.	No damage, interruption of production for 12 hours.

The probability, or likelihood, is the possibility that an identified hazard will result in an incident or an accident. The indices for expressing the probability of occurrence of a hazard have been developed by taking into account, whenever possible, the history of events in the industry or an estimate based on engineering studies where historical data are absent. The hazard scenarios were assessed based on probability classes. Table 3 defines these classes.

### 3. Classes of probability of occurrence

Probability of occurrence	Definition
Very high	Expected to occur in most circumstances
High	May occur in most circumstances
Medium	May occur at some time
Low	Could occur at some time
Very low	Could occur in exceptional circumstances

Estimation of risks is affected by a degree of uncertainty. Table 4 lists the levels of uncertainty that affect the estimation of risks in each case.

### 4. Levels of uncertainty

Levels of uncertainty	Definition
Very high	Missing information: new technology, new configuration
High	Some information is available: adaptation of a technology for a new area of application
Medium	A variety of information is available: use of a technology already in use elsewhere, with modifications
Low	A variety of information is available: use of a technology already in use elsewhere, with a few modifications
Very low	A variety of information is available: use of a technology without modification in identical applications

### 5. Acceptability criteria

Level of risk	Definition
Very high	Intolerable – The most senior official in the company is notified about the risk and ensures that mitigation and risk reduction plans are implemented.
High	Intolerable risk – The Vice-President sees to the ongoing implementation of preventative control measures and risk reduction plans, as well as the re-evaluation of risks at regular intervals.
Medium	Risk that must be reduced to a level As Low As Reasonably Practicable (ALARP). Management monitors the risks, makes sure that the control measures and mitigation plan are effective, and ensures that the proper procedures are followed.
Low	Acceptable risks – Front-line supervisors must ensure that employees and subcontractors are aware of the risk and the established procedures, and that the control measures are implemented.
Very low	Negligible risk

Technology risks are summarized in the table below. The level of consequences, probability of occurrence and level of uncertainty and risk occurrence were evaluated based on the risk matrix illustrated above, the degree of severity of consequences, the classes of probability of occurrence, the levels of uncertainty and the risk acceptability criteria.

## b) Summary of technology risks

Risk Identification	Description of Risk	Consequences	Probability	Level of Uncertainty	Risk
Petroleum product storage and use	Fuel storage with spill and contamination of environment	M	L	L	M
	Fuel-associated fire	L	L	L	L
	Petroleum products, grease and lubricants, spill and contamination of the environment	L	L	L	L
Hazards associated with various chemicals	Wheat starch silo, silo incident and unloading of starch truck	H	L	L	M
	Equipment used for wheat starch dissolution	H	L	L	M
	Various chemicals	M	L	L	M
Risks associated with tailings impoundment areas and waste rock piles	Failure of Clet Creek tailings pond dike	TH	VL	L	M
	Surface runoff flow	M	L	L	M
	Slumping of overburden dumps	M	L	L	M
Risks associated with Arnaud rail line	Derailment	H	L	L	L
Risks associated with La Relance terminal at the Port of Sept-Îles	Fire	H	VL	L	L
Risks associated with other hazards	Forest fires	L	M	M	M
	Blasting, vibrations, flyrock and other nuisances	L	L	L	L
	Transport and handling of explosives	VH	L	L	M