



Canadian Environmental
Assessment Agency

Agence canadienne
d'évaluation environnementale

BlackRock Mining Project

Comprehensive Study Report



June 2014

Canada 

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Executive Summary

BlackRock Metals Inc. (the proponent) is proposing to develop an iron-titanium-vanadium mine with an annual production capacity of 12.4 million tonnes of ore and 3 million tonnes of iron and vanadium concentrate. The project is located in territory covered by the James Bay and Northern Quebec Agreement (JBNQA) in the municipality of Chibougamau. The project consists primarily of an open pit mine, an ore processing plant, and mine waste impoundment and storage areas. In addition, a 26.6-km railway line will be constructed between the mine site and the existing Canadian National (CN) railway line.

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 and the Governor in Council will likely have to make decisions for the project pursuant to the *Fisheries Act*, the first to allow an activity that results in the harmful alteration, disruption or destruction of fish habitat, and the second to allow the disposal of mine tailings in waters frequented by fish. The project is also subject to a comprehensive study type environmental assessment (EA) as it corresponds to the definition in paragraph 16(a) of the *Comprehensive Study List Regulations*, which reads as follows:

“The proposed construction, decommissioning or abandonment of a metal mine, other than a gold mine, with an ore production capacity of 3,000 t/d or more.”

The project is also subject to a provincial environmental and social impact assessment under section 22 of the JBNQA.

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, Health Canada and the Cree Nation Government. In the comprehensive study report, the Agency presents the effects of the project on the following valued ecosystem components: water resources, air quality, 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 and social impact assessment and supplementary documents, opinions provided by federal experts, as well as comments received from the public, the Cree Nations of Oujé-Bougoumou and Mistissini and the Pekuakamiulnuatsh Takuhikan Innu First Nation.

Concerns were raised by the Cree and Innu communities and the general public about the following aspects: access and use of the area, water quality, air quality, protection of fish and fish habitat, contamination of food resources, site safety, the impact of rail transport and cumulative impacts.

The proponent has committed to implement mitigation measures in order to reduce the project’s potential environmental effects. These measures include developing a water management plan, restricting work during sensitive periods for wildlife, and implementing compensation measures relating to fish, bird and terrestrial wildlife habitat and to loss of Aboriginal use of the area. The proponent is also proposing to implement an environmental management program that includes follow-up of various valued biophysical and human components, as well as an emergency response plan to be used in the event of accidents or spills.

A follow-up program is required under the former Act to verify the accuracy of the environmental assessment and to determine the effectiveness of the proposed mitigation measures. Fisheries

and Oceans Canada, as a responsible authority 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 examine this report and the comments received from the public and Aboriginal groups before issuing the environmental assessment decision statement. If the environmental assessment decision is favourable, Fisheries and Oceans Canada 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 MMER.

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List of acronyms and abbreviations

JBNQA	<i>James Bay and Northern Quebec Agreement</i>
COMEX	Provincial Review Committee
cm	centimetre
CN	Canadian National
federal committee	Federal Environmental Assessment Committee
GHG	greenhouse gas
ha	hectare
km	kilometre
kt CO₂ eq	kilotonne carbon dioxide equivalent
kV	kilovolt
Agency	<i>Canadian Environmental Assessment Agency</i>
Proponent	BlackRock Metals Inc.
former Act	Canadian Environmental Assessment Act
m³	cubic metre
mm	millimetre
Mm³	million cubic metres
MDDELCC Fight	Quebec Department of Sustainable Development, Environment and the Against Climate Change
M/O-57	Trapline No. 57 of the Oujé-Bougoumou and Mistissini Cree Nations
O-59 or O-60	Trapline No. 59 (60) of the Oujé-Bougoumou Cree Nation
MMER	<i>Metal Mining Effluent Regulations</i>

1. Introduction

1.1 Project overview

BlackRock Metals Inc. (the proponent) is proposing to develop an iron-titanium-vanadium mine with an annual production capacity of 12.4 million tonnes of ore and 3 million tonnes of iron and vanadium concentrate. The project is located in territory covered by the James Bay and Northern Quebec Agreement (JBNQA) in

the municipality of Chibougamau. The project consists primarily of an open pit mine, an ore processing plant, and impoundment and disposal areas. In addition, a 26.6-km railway line will be constructed between the mine site and the existing Canadian National (CN) railway line.

Figure 1: Project location



1.2 Environmental assessment process

This project is subject to the *Canadian Environmental Assessment Act* (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 BlackRock mine project is being carried out 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 under the former Act is required because Fisheries and Oceans Canada will likely have to issue authorizations within the framework of the project pursuant to the *Fisheries Act* to allow an activity that results in serious harm of fish and fish habitat. Fisheries and Oceans Canada is therefore a responsible authority in respect of the environmental assessment. In addition, pursuant to paragraphs 36(5)(a) to (e) of the *Fisheries Act*, the Governor in Council may amend Schedule 2 of the *Metal Mining Effluent Regulations* (MMER) to add one or more water bodies as mine waste impoundment areas.

The project was subject to a comprehensive study type EA as it corresponds to the definition in subsection 16(a) of the *Comprehensive Study List Regulations*, which reads as follows:

The proposed construction, decommissioning or abandonment of a metal mine, other than a gold mine, with an ore production capacity of 3,000 t/d or more. The project was also subject to a provincial environmental and social impact assessment under section 22 of the JBNQA. Acting on the recommendations of the Provincial Review Committee (COMEX), the provincial administrator issued a certificate of authorization for the BlackRock project, including various conditions for its implementation, on December 6, 2013.

1.3 Purpose 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, 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, Natural Resources Canada, Environment Canada, Health Canada and the Cree Nation Government.

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 EA decision, the Minister may request supplemental information or request that additional measures be taken. If the minister decides that the project is unlikely to have significant adverse environmental effects, Fisheries and Oceans Canada 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 MMER.

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.

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 and railway line, as described in the sections below.

2.1 Project Components

The project as presented by the proponent in the implementation plan comprises a mine and related facilities (see Figure 2).

The mine includes the following:

- an open pit mine and all related surface infrastructure;
- an ore processing plant (crushers, concentrator and related buildings);
- a covered ore stockpile;
- a fine tailings site with a capacity of 28.8 million cubic metres (Mm³);
- a coarse tailings site with a capacity of 42 Mm³;
- a waste rock dump with a capacity of 75.38 Mm³;
- a topsoil and overburden storage area;
- an industrial water treatment plant and associated infrastructure;
- polishing, processing and measurement ponds;
- dikes for the fine tailings ponds and polishing, processing and monitoring ponds;
- drainage collection ditches.

The associated facilities are as follows:

- existing access roads to be upgraded;
- a 26.6-km railway line and associated facilities;
- fuel storage area and garages;
- a detonators and explosives storage area;
- a hazardous materials storage area;
- an on-site service road network;
- a construction camp with 500 individual rooms, cafeteria, drinking water system and domestic water treatment plant;
- water intakes and drinking water treatment systems;
- borrow pits;
- various other buildings and facilities.

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 remediation.

2.3 Schedule

The proponent anticipates that the construction phase, which should begin in 2015, will last two years. Ore production should begin in 2017 and will continue for 14 years. Closure and remediation will be carried out over five years starting in 2031.

Table 1 Project activities

Preliminary work and construction	Operation	Decommissioning and remediation
2 years	14 years	5 years
<ul style="list-style-type: none"> • Site clearing and grading; • Set up of construction camp; • Development of borrow pits; • Explosives manufacturing, storage and handling; • Construction of dikes and impoundment of water needed for operations; • Development of impoundment and disposal areas (ore, waste rock, tailings, overburden); • Construction of buildings (concentrator, garage, reservoir facilities); • Construction of the railway line; • Preparation for mining: stripping, blasting, separate storage of topsoil and overburden/backfill; • Establishment of the surface and groundwater management system (ditches, culverts, water treatment system); • Installation of water pumping and lake and stream drainage systems; • Construction of service roads and upgrading of existing access roads; • Management of wastes and hazardous materials. 	<ul style="list-style-type: none"> • Drilling and blasting; • Extraction, handling, storage and transport of ore, waste rock and overburden; • Water supply; • Ore processing (crushing, grinding, magnetic separation, flotation, dehydration and heating of the concentrate); • Loading and transport of ore concentrate; • Water management: effluent, mine water, process water, drinking water, runoff and sewage; • Dewatering of the ditch through mine water pumping; • Management of mine wastes; • Gradual rehabilitation of the mine site; • Operation and maintenance of the railway line. 	<ul style="list-style-type: none"> • Decommissioning of buildings and support infrastructure; • Decommissioning of the sanitary facilities; • Decommissioning of the railway: removal of the tracks, culverts and culvert bridges; • Closure of the ditch; • Final rehabilitation and revegetation of the mine site, waste rock piles, tailings ponds and railway corridor; • Management of wastes and waste hazardous materials; • Rehabilitation of contaminated sites, as required; • Surface water control and monitoring.

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 considered

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) of the former Act, the Agency also asked the proponent to describe the need for and alternatives to the project.

Environmental effects are defined in the former Act 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 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

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 (see Figure 3).

With respect to temporal boundaries, the proponent examined the effects of the project over a 21-year period, covering the construction, operation, closure and remediation of the mine and railway.

- The regional study area consists of the municipality of Chibougamau, the regional county municipality of Domaine-du-Roy, and the municipalities and enclave communities of Chapais, Oujé-Bougoumou and Mistissini. The study area thus defined situates the project within its regional socio-economic and geographic context. It served as a basis for establishing a profile of the Aboriginal and non-Aboriginal communities near the project in order to assess the impacts of the project that will be felt on a larger scale on components of the human environment. The regional study area also provides a basis for addressing aspects of the natural environment that can affect the project components.
- The local study area of the mine project, as shown in Figure 3, covers an area of 700 km² between Route 167 and the northeast part of Lake Chibougamau. It includes the sites of the iron ore extraction and concentration operations and associated infrastructure. The potential effects of the project on all aspects of the biophysical and human environment can be identified and analyzed on the basis of the local study area.
- The restricted study area, as shown in Figure 3, was defined within the local study area. It extends no more than 1 km on either side of the railway line, for a total of 53.2 km². The proponent has conducted a detailed analysis of the aspects of the biophysical and human environment within that area that are most likely to be affected by the railway line.

3.3 Determination of valued components

The assessment of the potential environmental and social effects conducted by the proponent focused on 18 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 aspects of the environment around six valued components that were examined in the comprehensive study. These value components are presented in Table 2, along with the rationale for their selection. The table also identifies the study area for each valued component, indicating the areas in which the assessment of impacts is concentrated.

Table 2 Valued components, rationale and spatial boundaries

Valued Components	Justification	Spatial Boundaries
Water resources: surface and groundwater quality, and the hydrologic regime.	Changes to water quality and the hydrologic regime affect the capacity of the aquatic environment to support life. Water quality is important to Aboriginal communities, to human health and well-being, and to wildlife species and aquatic biota. It is one of the main pathways by which the project can affect the aquatic ecosystem. Water quality is subject to a provincial directive (<i>Directive 019 sur l'industrie minière</i>) ¹ and to federal regulatory requirements (MMER).	Local study area specifically in the Lake Jean sub-watershed and restricted study area along the railway corridor.
Air quality: dust, nitrogen oxides, sulphur dioxide, carbon monoxide and greenhouse gases (GHG).	Air quality is important to human health, including members of the Oujé-Bougoumou, Mistissini and Pekuamiulnuasth Takuhikan Aboriginal communities who use the local study area. GHG emissions contribute to climate change, which causes environmental and human health effects.	Local study area. Atmospheric dispersion modelling was carried out within a 13-km radius of the mine construction zone. GHGs are examined in a broader context as their effects on the environment is a concern at the provincial, national and world level.
Fish and fish habitat: the water environment including aquatic and riparian vegetation and fish species.	Fish and fish habitat contribute to local fishing activities (including traditional fishing) and support ecological diversity. They are protected under the <i>Fisheries Act</i> .	Local study area, specifically in the Lake Jean sub-watershed and at the outlet of Lake Jules.

¹ *Directive 019 sur l'industrie minière* is the tool commonly used for the analysis of mining projects requiring a certificate of authorization under the Quebec *Environment Quality Act*. It contains provisions designed to protect surface and ground water. The *Metal Mining Effluent Regulations* (MMER) apply to mines that discharge harmful substances to waters. The MMER prescribes limits for arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids (TSS), radium 226, and pH in mine effluent.

Table 2 Valued components, rationale and spatial boundaries continued

Valued Components	Justification	Spatial Boundaries
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 Cree communities who use the area.	Local study area, specifically in the mine site area and along the railway line. The habitat availability assessment takes the regional scale into consideration.
Terrestrial wildlife and their habitat: reptiles and amphibians, fur-bearing animals, small and large mammals and their habitat.	Several species, including moose, are hunted by members of the Cree communities of Oujé-Bougoumou and Mistissini who use the area.	Local study area specifically in the mine site area and along the railway line. The habitat availability assessment takes the regional scale into consideration.
Current use of land and resources for traditional purposes and site or thing of archaeological, heritage or historical significance.	The project is likely to cause impacts on traditional users of the area and on the resources they harvest. The project is located on JBNQA Category III lands over which Cree have established rights.	Local study area comprising all of trapline 0-59, and parts of traplines 0 57, 0-60 and 24.

3.4 Need for and purpose of the project

The proponent has indicated that since 2010, world demand for iron ore has outstripped the supply and is increasing, particularly in China. With respect to vanadium, production is concentrated in China, South Africa and Russia, and it is not sufficient to ensure a regular supply to markets. The proponent

believes the project is required in order to better meet the demand by introducing a new supply of iron and vanadium destined for Asia. The proponent also believes the project will be profitable and will generate socio-economic benefits for Quebec and for communities in the region through the creation of several hundred direct and indirect jobs.

4. Alternatives to the project and assessment 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. The world demand for iron ore and vanadium could be met by mining deposits elsewhere in the world, which would deprive Quebec of the resulting socio-economic benefits. The only alternative to this mining project would be not to carry it out.

4.2 Assessment of alternative means

The proponent examined a number of alternatives in terms of the choice of location and layout of the following project components: the crusher and processing plant, process water supply, tailings ponds and waste rock dumps, access road, railway line and work camp. For each of these project components, the proponent identified the best options from a technical, socio-economic and environmental point of view, as required by the federal guidelines. It based its assessment on its own knowledge of the biophysical and human environments, taking into account the results of the consultations with the public and Aboriginal groups. The proponent selected the best alternative means, taking the following factors into consideration: soil bearing capacity, footprint reduction, social impact, and impact on sensitive environments, such as wetlands, peat bogs, and lakes and streams.

It should be noted that the location of the open pit cannot be modified and was not included in the assessment of alternative means since the drilling and metallurgical testing conducted by various mining companies over the years and stepped up in recent decades demonstrate the viability of the project based on the pit thus defined. The only other location that is sufficiently well defined to

be mined is located 2 km to the northeast; it was not selected because the mining claims to the area are divided among several holders.

A summary of the assessment of alternative means for carrying out the project is presented below. A table providing information on the alternative means and their advantages and disadvantages is presented in Appendix 1.

Location of the crusher and processing plant

The crusher, processing plant and surrounding work areas occupy an area of 38 ha. They must necessarily be located close to the pit and to the process-water supply reservoir and on a rock surface with no structural anomalies.

The proponent examined four options around Lake Denis and the pit for the location of the crusher and processing plant. Option D located southeast of Lake Denis was selected, as it has a number of advantages: it is located within the mining claims held by BlackRock and on soil with geomechanical properties that meet the technical requirements; it requires the removal of little overburden and it will result in a minimal footprint.

Source of process water supply

The water supply flow for the plant was established at 5,167 m³/d. Given the low permeability of the bedrock in the vicinity of the mine site, the possibility of installing an underground water intake with a flow that would meet the necessary rate is limited. The proponent examined eight sites for the installation of a surface water supply system. Lake Armitage and the Armitage River are the only two bodies of water with a sufficient flow to meet the Quebec Department of Sustainable Development, Environment and the Fight Against Climate Change (MDDELCC) criterion for the protection of aquatic life and other water uses.

However, they were not selected because they are used by the tallyman of trapline O-59 and because they provide important spawning habitat for walleye that use Lake Chibougamau.

As a result, the proponent opted for a water supply system that would allow closed-loop recycling of 90% of the water used in the process. The process water will come from streams and lakes upstream of Lake Jean and will be collected in two reservoirs—the fine tailings pond and the polishing pond—by means of dikes installed at the start of construction.

Tailings ponds and waste rock dumps

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).²

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 (MMER)*.

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 disposal areas for three types of mine waste: waste rock, fine tailings and coarse tailings. After eliminating sites that posed major constraints, such as the lack of availability of land or unacceptable risks of water contamination, two potential sites were selected for each category of mine waste. The proponent then conducted

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)²

an environmental, technical and socio-economic characterization of each potential site. He then developed four potential scenarios³ for the location of the disposal areas, which were compared on the basis of environmental, technical and socio-economic criteria.

On the basis of this process, scenario 2 (see Figure 4) was found to be the most advantageous when taking into account all issues in accordance with the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*. Under this scenario, the fine tailings pond is located west of the pit, the coarse tailings pond is located west of the fine tailings pond, and the waste rock dump is located east of the pit. This scenario limits the footprint around the pit and mine infrastructure, and it minimizes the environmental impacts. According

² Guidelines for the Assessment of Alternatives for Mine Waste Disposal

<http://www.ec.gc.ca/pollution/default.asp?lang=En&n=125349F7-1&offset=1&toc=show>

³ Scenarios combining locations of 3 types of mining waste are presented in appendix 1 in figures 4, 7, 8 and 9

to the proponent's assessment, it is the scenario that has the least impact on most components of the human, physical and biological environments. Moreover, it is the scenario that involves the least risk to operations, decommissioning, restoration and follow-up monitoring phases of the project. It minimizes the distance over which fill materials must be transported for restoration and to the number of final effluents to be monitored. This scenario also allows for the expansion of the mine waste disposal area.

Although it minimizes the footprint around the pit and mine infrastructure, scenario 2 requires encroachment of the proposed infrastructure on natural waters frequented by fish. However, the 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 MMER. Environment Canada is of the view that the assessment conducted by the proponent meets the requirements with respect to the assessment of alternatives.

Access road

From Route 167, there is a stretch of roughly 30 km that must be travelled on existing roads to access the mine site. The proponent examined several combinations of road segments (see Appendix 1). The option selected by the proponent is that which ensures a high level of road safety and the least impact on streams and on hunting and fishing activities. The selected route is 31.2 km long; it begins at kilometre 200 of Road 167, follows Forest Road 210, then Lake France road and finally Lake Denis road.

Railway line

A roughly 26.6-km railway line will be built to connect the mine site with an existing Canadian National line. Even though the proponent did not complete an alternative analysis, he had selected a route for the line, which was improved on the basis of the following factors:

- fewer stream crossings;
- distance from the site of the unique Portage-Mackenzie forest ecosystem;
- distance to be maintained from the shores of Lake Pillow, a resort, hunting and fishing sector;
- minimal cut and fill.

The optimal route selected is the result of a number of improvements made by the various specialists involved in the project.

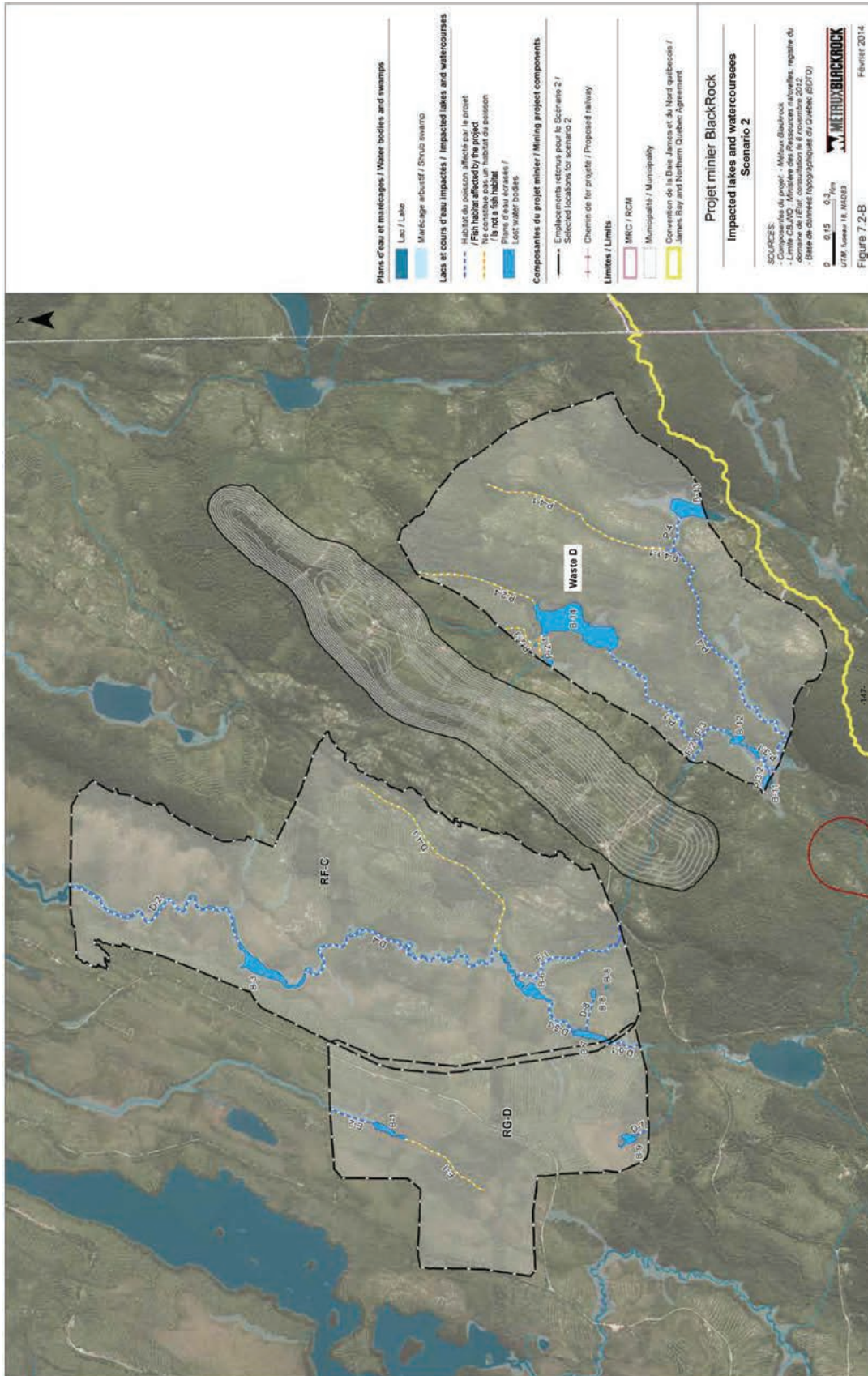
Work camp

The proponent examined two options for the location of the work camp, namely the Lemoine Road site and the Forest Road 210 site. The latter was selected because it is closer to the mine site and encroaches to a lesser extent on wetlands.

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 on the basis of the analysis of alternative means represent the solutions having the least environmental and social impact, while taking into account the technical and economic criteria for this type of project.

Figure 4: Selected location for the mine waste disposal areas



Source: BlackRock Metals, March 2014, page 147

5. Consultations

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 BlackRock Mining Project, the Agency, together with the federal committee, conducted a number of public and Aboriginal consultation activities.

The comments and concerns received through consultations help to clarify the potential effects of a project, beginning at the planning stage.

The Agency administers a Participant Funding Program to support individuals, non-profit organizations, and Aboriginal groups interested in participating in federal environmental assessments. As part of this comprehensive study, the Agency allocated a total of \$70,000 to the Oujé-Bougoumou and Mistissini Cree Nations and to the Pekuakamiulnuatsh Takuhikan Innu First Nation.

Parallel consultations were also held by Environment Canada on the assessment of alternatives for mine waste disposal and on the fish habitat compensation plan required under the *Metal Mining Effluent Regulations*.

5.1 Public consultations conducted by the federal government

The former Act 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.

The first consultation seeking comments on the project and the conduct of the comprehensive study, took place from May 30 to July 11, 2011. The Agency received only one brief from the Chapais municipal council, expressing its support for the project and its interest in the economic benefits, including those related to the potential increase in population and in the number of businesses, the possible upgrading of existing infrastructure, and the social and cultural development of the region that could result from the project.

The second consultation took place from June 24 to July 24, 2013, giving interested parties an opportunity to comment on the potential environmental effects of the project and the mitigation measures proposed in the proponent's environmental impact statement. On July 9, 2013, the Agency held an evening consultation activity that was attended by approximately 50 non-Aboriginal residents of James Bay communities. The Agency then received written comments from 20 individuals essentially expressing support for the project.

For the third public consultation opportunity, the Agency invited the public to provide comments on the content, conclusions, and recommendations of this comprehensive study report. The Agency will present the comments received to the Minister of the Environment to assist in the environmental assessment decision. Parallel consultations were held by Environment Canada on possible amendments to Schedule 2 of the *Metal Mining Effluent Regulations* and on the compensation plan for the loss of fish habitat resulting from the use of water bodies for mine waste disposal.

5.2 Aboriginal consultations conducted by the federal government

5.2.1 Analysis of the need for consultation

The Crown 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. In addition, the former Act requires that all federal environmental assessments consider the 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 former Act also requires consideration of the 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 Crown’s duty to consult Aboriginal persons and to facilitate a whole-of-government approach, the Agency, as Crown Consultation Coordinator for the environmental

assessment of the project, held consultations with the Oujé-Bougoumou and Mistissini Cree Nations. These two communities are current users of the project area as well as parties to the James Bay and Northern Quebec Agreement, which is protected under section 35 of the *Constitution Act, 1982*. The Agreement grants hunting, fishing and trapping rights, as well as the exclusive right to harvest certain species, including black bear, beaver, fox and sturgeon. The project was considered to be likely to infringe on the treaty rights of the Cree Nations of Oujé-Bougoumou and Mistissini.

At the request of the Cree Nation Government, a public corporation charged with representing the interests of the Quebec Cree, the Cree Nation of Waswanipi was invited to comment on the environmental effects of the project. However, it did not provide any comments as part of the environmental assessment for this project.

The Agency also invited the Innu Nation of Pekuakamiulnuatsh Takuhikan to participate in the environmental assessment of the project. It informed the Agency that it felt that the project was likely to prejudice its current use of the land for traditional purposes owing to the anticipated impacts on the ecosystem, wildlife and flora.

5.2.2 Consultation activities

The Agency had agreed on a consultation plan with the Aboriginal groups that provides for engagement activities during the various phases of the environmental assessment. At the end of the process, the Aboriginal groups will have had three formal consultation opportunities. In addition, the Agency maintained regular communication with the Aboriginal groups throughout all stages of the comprehensive study.

The Agency and the Grand Council of the Crees agreed on an approach to allow for participation by the Cree Nation in the environmental assessment process established under the former Act. Under

this approach, a representative of the Cree Nation Government participated in the federal committee's work and had an opportunity to take part in the development of the Cree Nation consultation plans, consultation activities, analysis of the environmental impact statement, and drafting of the comprehensive study report.

The Agency announced the three formal consultation opportunities via correspondence to the affected First Nations band councils, notices in *The Nation* and *L'Étoile du lac* newspapers, and news releases on CINI-FM 95.3, Planète FM and CHUK-FM.

During the first consultation, which was designed to seek comments on the project and the conduct of the comprehensive study, the Agency received a brief from the Oujé-Bougoumou Cree Nation presenting its concerns about the anticipated impact of the project on community well-being, the use of the area, the traditional economy, the culture, health, water quality, fish, wildlife, and air quality.

The second consultation gave the communities an opportunity to comment on the potential environmental effects of the project, the potential impacts on asserted or Treaty rights, and the accuracy of the information provided by the proponent in the environmental impact statement. During that phase, the Mistissini and Oujé-Bougoumou Cree Nations submitted briefs to the Agency and took part in evening open houses and work meetings held on July 8 to 10, 2013. The meetings provided an opportunity to dialogue between the communities and the federal committee. The Pekuakamiulnuatsh Takuhikan Innu First Nation also submitted a brief to the Agency.

For the third consultation period, the Agency invited the Aboriginal groups to provide comments on the content, conclusions, and recommendations of this comprehensive study report. The Agency will present the comments received to the Minister of the Environment to assist in the environmental assessment decision. If the environmental assessment decision is favourable, Fisheries

and Oceans Canada may hold further consultations on the authorizations to be issued for serious harm to fish.

Parallel consultations with the affected First Nations were held by Environment Canada on the possible amendments to Schedule 2 of the MMER and on the compensation plan for the loss of fish habitat resulting from the use of water bodies for mine waste disposal.

5.3 Consultation activities conducted by the provincial government

The project was reviewed by COMEX, a provincial review committee established under Section 22 of the JBNQA and composed of representatives appointed by the provincial and Cree Nation governments. COMEX held public meetings in Oujé-Bougoumou and Chibougamau on June 11 and 12, 2013.

5.4 Engagement activities conducted by the proponent

Since the filing of the project notice in July 2010, the proponent has organized numerous meetings with local stakeholders, including Aboriginal groups, municipal authorities, and local and regional economic development and manpower training organization. The proponent has also held open door sessions in Chibougamau, Oujé-Bougoumou and Mistissini.

The proponent met with the band councils of the Cree Nations of Oujé-Bougoumou and Mistissini as well as with the Innu of Pekuakamiulnuatsh Takuhikan. It also held discussions with the talley-men and users of traplines O-59 and M/O-57.

The purpose of the meetings and discussions was to provide information on the project and to document the concerns and traditional knowledge of the stakeholders in order to be able to take them into account in the development of the project.

5.5 Concerns raised

Many non-Aboriginal residents of James Bay expressed a strong interest in the implementation of the project owing to the possibility of job creation in the region. They suggested that the proponent use local expertise in identifying fish habitat compensation projects, and they proposed that lakes in the region, such as Lake Opinaka, be stocked with walleye for fishing.

The Oujé-Bougoumou and Mistissini Cree Nations focussed primarily on the following issues:

- *Cumulative impact on the area:* Because the project area has been impacted by numerous development projects and activities, there are concerns about the potential additional effects of the project on small wildlife species, plants, and fishing, hunting and trapping activities. They ask the proponent to take account of the possibility of a second phase of the project in its cumulative effects assessment.
- *Access to the area:* The community members asked the proponent to clearly indicate the limitations on access to the mine site.
- *Water quality:* Questions and concerns were raised about the feasibility of keeping contaminated water within the boundaries of the mine site. The community members want the proponent to follow through on its commitment to minimize the risks of leaching and spills of contaminants into groundwater and water bodies in the area. They asked to be informed of the nature and use of any chemical products used on the mine site.
- *Air quality:* The community members asked that the proponent implement an air quality monitoring program to address the risk of airborne contaminants.
- *Contamination of traditional food:* A number of community members expressed concerns about the risk of contamination of traditional food sources, primarily fish.

- *Protection of fish and fish habitat:* Stakeholders noted the risk of harmful alteration of fish habitat by suspended sediments and by mine effluent, which could be discharged to streams, particularly in respect of Lake Denis.
- *Site safety:* Stakeholders expect the proponent to ensure the safety of the site, particularly the open pit, following site decommissioning and restoration.

The Pekuakamiulnuatsh Takuhikan Innu First Nation raised the following concerns:

- *Impact of rail transport:* The increase in traffic on the existing railway line that runs through the community's traditional territory could result in environmental impacts. The community asked that the risks of mortality, noise nuisances, the impact of potential failures on plants and animals, and air and water quality be documented.
- *Encroachment on its land ("Nitassinan"):* The community feels that a waste rock dump encroaches on its traditional territory and is concerned about the fact that this encroachment is not indicated on the maps of the proponent's environmental impact statement.
- *Use of the area:* The community believes that the study on the effects of the project on its use of the area is inadequate. It wonders about the impact of the project on its asserted rights over the long term. There is a risk that the presence of 200 workers on the site will open up the area, place increased pressure on resources, and lead to poaching.

The community members want the proponent to follow through on its commitment to minimize the risks of leaching and spills of contaminants into groundwater and water bodies in the area.

5.6 Accommodation and conclusion of the Agency on impacts on Aboriginal rights

The information provided to the Agency during the Aboriginal consultations shows that the project is likely to cause adverse effects on established or potential Aboriginal and treaty rights.

The proponent and the Government of Canada have identified measures designed to mitigate or accommodate the issues raised by the Aboriginal groups during the environmental assessment.

The proponent has signed an Impacts and Benefits Agreement (IBA) with the Oujé-Bougoumou Cree Nation and the Cree Nation Government that provides for mechanisms for cooperation and engagement by the community in the environmental monitoring of the project.

In addition to that agreement, mitigation measures designed to reduce the environmental effects constitute accommodation for the impacts of the project on the established or potential rights of the Aboriginal communities. These measures relate specifically to water resources, wildlife, fish, and

The proponent has signed an Impacts and Benefits Agreement (IBA) with the Oujé-Bougoumou Cree Nation and the Cree Nation Government that provides for mechanisms for cooperation and engagement by the community in the environmental monitoring of the project.

land use. They are described in Chapter 7 and Appendix 2 of this report. Each of the concerns expressed by the Aboriginal groups is also addressed in Appendix 9.

On the basis of these measures, the Agency concludes that the potential adverse effects on established or potential Aboriginal and treaty rights will be satisfactorily avoided or mitigated.

Figure 5: Public consultation in Mistissini



Photo: BlackRock Metals, July 10, 2013

6. Profile of the environment

6.1 Biophysical context

The BlackRock Mining Project is located in the Superior Province (geological formation), which is composed of metasedimentary and magmatic rocks. The relief of the study area consists of a plain dotted with hills having an average elevation of 420 m. The summit of the hill containing the deposit is 533 m.

The area has a continental subhumid-subpolar climate with a mean annual temperature of 0 °C, a maximum of 22.2 °C in July, and a minimum of -24.2 °C in January. Total annual precipitation averages 660 mm of rain and 300 cm of snow.

The BlackRock Mining Project is located at the divide between the James Bay and St. Lawrence River watersheds. The mine site is located in the Lake Jean sub-watershed, which is surrounded by that of the Villefagnan River to the north, Lake Laugon to the east, Lake Denis to the south and the Armitage River, Lake Bernadette and Lake A-1(406) to the west. The railway route is surrounded by the sub-watersheds of Lake Bernadette, Wynne Creek, Audet Creet, Boisvert River and Lake Dufresne (see Figure 6).

Sampling carried out by the proponent has indicated that the surface waters in the study area have a pH between 7.1 and 7.9 and high mineralization parameters relative to the other regions of Quebec.

The studies conducted by the proponent show that groundwater flow is influenced by the rugged topography of the site and the type of surface material, which does not promote drainage or soil permeability. The groundwater is characterized by a weakly alkaline pH and has low concentrations of total dissolved solids and metals. The hydraulic conductivity decreases with depth, indicating that the groundwater contains low concentrations of mineral salts.

One third of the local study area consists of wetlands and aquatic environments, primarily lakes, streams, peat bogs, and shrub swamps. The local study area is in the black spruce-moss domain, dominated by black spruce, but also containing Jack pine, balsam fir, white birch, and trembling aspen. However, timber harvesting in recent decades has disturbed the vast majority of the local study area, which is now colonized by young (over 20 years) or regenerating (0–20 years) deciduous stands.

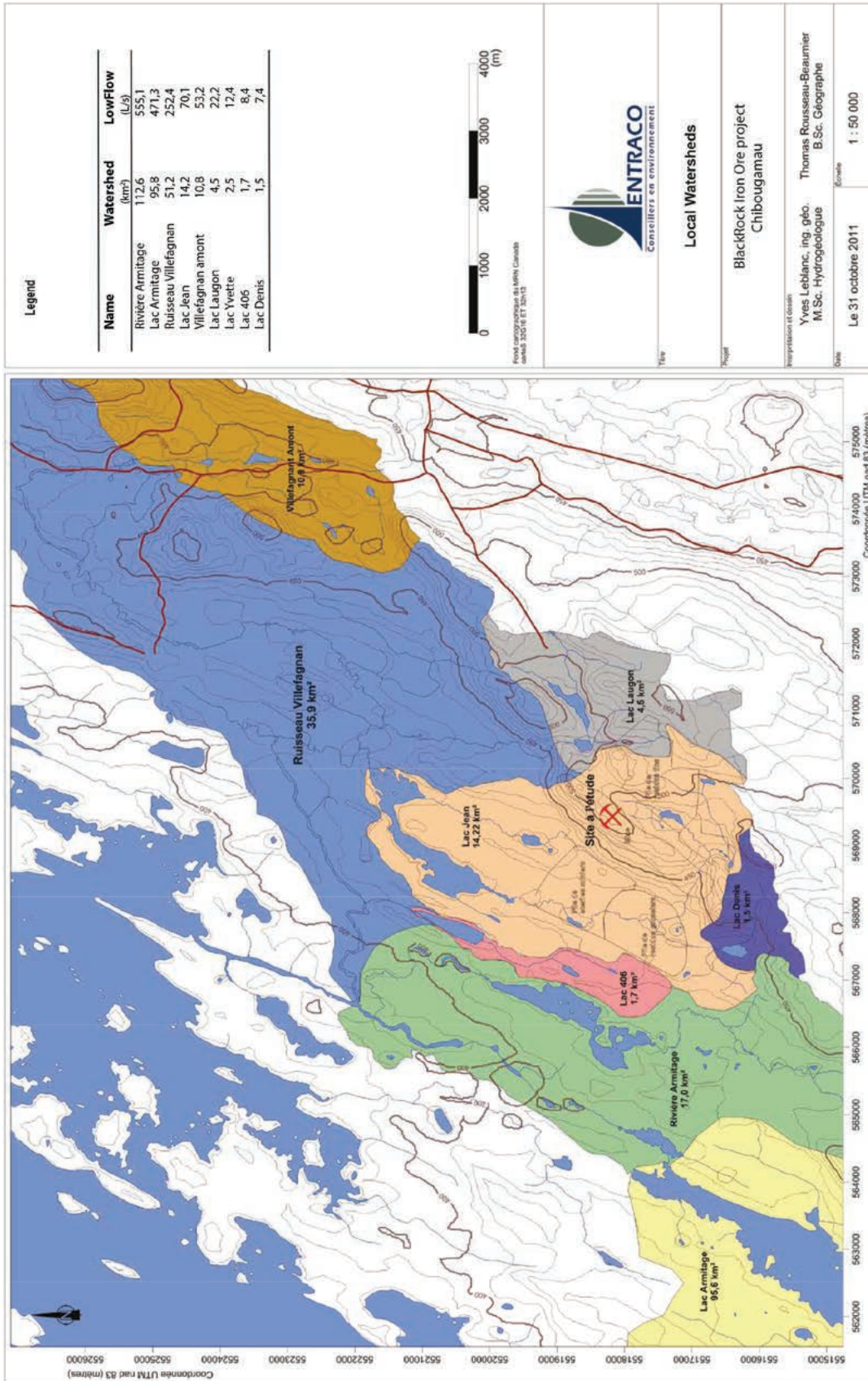
Large numbers of many species of mammals, birds, reptiles, and amphibians occur in the local and regional study areas, using the forests, lakes, rivers and wetlands as feeding and breeding habitat.

Four terrestrial bird species with special status under the *Species at Risk Act* use the area, namely Canada warbler, common nighthawk, olive-sided flycatcher and rusty blackbird.

Surveys conducted by the proponent confirm the presence of several species of fish in the local study area, including northern pike, brook trout, walleye, white sucker, yellow perch, burbot and fallfish. A number of small species were observed, including longnose dace, northern redbelly dace, pearl dace, trout perch, brook stickleback and mottled sculpin.

Lastly, nine reptile species potentially occur in the study local area, four of which were confirmed by observations by the proponent.

Figure 6: Sub-watersheds at the mine site



Source: Groupe Conseil Entraco Inc., 2011, Vol. 2, page 159

6.2 Human context

The project is located in the administrative region of Nord-du-Québec, primarily in the municipality of Chibougamau and on territory covered by the James Bay and Northern Quebec Agreement. The area is occupied by the Cree and non-Aboriginal communities of James Bay. In 2011, the Nord-du-Québec region had a total population of 42,330, including 7,541 in the municipality of Chibougamau, 725 in the Cree community of Oujé-Bougoumou, and 3,427 in the Cree community of Mistissini.

The area is governed by various organizational and administrative structures established under several acts and agreements, including the James Bay and Northern Quebec Agreement, which provides for the subdivision of the area into Category I, II and III lands. The levels of exclusive hunting, fishing, and trapping rights granted to the Cree are established for each category. The study area lies within Category III lands, where the Cree have the exclusive right to hunt certain aquatic species and certain fur-bearing animals, but not to the exclusion of other non-Aboriginal users, who enjoy certain recreational hunting and fishing rights on the land.

The Grand Council of the Crees (Eeyou Istchee), along with the Cree Nation Government as the administrative entity, represent the Cree and have the power and authority to promote, coordinate and administer programs to protect traditional Cree culture, way of life, and community development.

The Pekuakamiulnuatsh Takuhikan Innu First Nation, located in the administrative region of Saguenay–Lac-Saint-Jean, expressed an interest in the project.

The main economic activities in the regional study area are associated with forestry, mining and tourism. Partridge, waterfowl, bear, and moose hunting is carried out by various users of the area, both Aboriginal and non-Aboriginal. Fishing is carried out primarily in the Lac Chibougamau and Lake Armitage sectors.

The traditional use of the territory in the local study area consists essentially in resource harvesting by members of the Cree communities of Oujé-Bougoumou and Mistissini, specifically waterfowl hunting, large game hunting, fur trapping, gathering and fishing.

There are no permanent residences in the local study area. However, there is a lease to operate a commercial resort and a Cree family's main seasonal camp about 12 km south of the mine site.

7. Environmental Effects Assessment

7.1 Approach

The Agency, in collaboration with the federal committee, defined and assessed the 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 and the provincial review committee (COMEX);
- information obtained during the public and Aboriginal consultations;
- expert opinions from the federal departments.

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 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 were integrated into the project design. In order to reach a conclusion on the significance of the residual effects, the Agency used the proponent method with criteria of magnitude, extent, duration, and probability of occurrence described in Appendix 3. The combinations used to determine the significance of the effect are presented in Appendix 4; they provide a basis for an overall determination of the significance of the effect based on five levels: very high, high, medium, low and very low. The environmental effects at the very high and high levels are considered significant, whereas effects at the medium, low and very low levels are considered insignificant.

Appendix 5 summarizes the valued components, the environmental effects, the mitigation measures, the analysis of the significance of residual effects and the Agency's conclusions on the significance of the residual environmental effects. The follow-up program directions are presented in Chapter 8.

7.2 Water resources

This valued component covers surface and groundwater, from the perspective of both quantity (hydrologic regime) and quality (concentrates of suspended solids, nutrients and contaminants). For this component, it is important to determine whether surface and groundwater supplies will remain suitable for human consumption, and whether surface water quality in the project area will remain adequate to support aquatic life and native terrestrial wildlife.

The local study area is characterized by many lakes and streams, the largest of which are Lake Jean, Lake A-1(406), Lake Bernadette, Lake Armitage, Lake Laugon, and Lake Denis (see Figure 2). All mine-related infrastructure has been grouped in the Lake Jean sub-watershed, which contains 10 small lakes, the largest of which is Lake Denis. The railway crosses 10 streams, the only permanent one being the outlet of Lake Jules.

In the low-relief portions of the study area, the water table is less than 2 m deep. In raised (high) areas, such as the sector planned for the open pit (see Figure 2), the water table lies in bedrock at a depth of between 4 and 10 m. Groundwater flow is typically limited due to the low permeability of the soil and bedrock, which restricts groundwater recharge from precipitation infiltration.

According to the proponent, surface and groundwater quality is good. Surface water concentrations of aluminum, barium, cobalt, iron, manganese, and lead in the study area meet MDDELCC generic criteria for the protection of aquatic life. The groundwater quality assessment conducted in the fall of 2011 indicates that the groundwater is generally very weakly mineralized. Low concentrations of iron, arsenic, copper and zinc were measured in the groundwater, and the groundwater quality meets the effluent requirements of Directive 019.

7.2.1 Potential environmental effects

The primary potential effects of the project on water quality and quantity are sediment loading to lakes and streams, leachate and chemical contamination of surface and groundwater, loss of lakes and streams, and changes in runoff, infiltration, and natural flow.

Effects on water quality

During the construction phase, the work associated with site preparation and development, grade crossings and drainage systems, and railway bridge and culvert construction could result in sediment transport into streams, particularly the outlet of Lake Jules.

During the operation phase, water quality could be affected by discharges of liquid effluents, including process waters and other mine effluents. According to the proponent, the analysis of waste rock, processing waste, and process waters indicates that there will be a low risk of contamination. The proponent planned that mining effluents will meet the criteria set out in the *Metal Mining Effluent Regulations* and Directive 019. The geochemical analyses conducted by the proponent showed a low probability of metal leaching and acid rock drainage from the tailings and waste rock.

Other potential effects on water quality are associated with possible accidental spills during the use of equipment, generators, and chemical weed control along the rail line. The release of construction camp sewage could also result in bacterial contamination of water.

Groundwater quality could be affected by infiltration of water from the tailings and waste rock impoundment. According to the proponent's analysis, such water will meet all effluent criteria of Directive 019.

Lastly, the use of explosives could release nitrogen compounds in the mine pit, resulting in groundwater contamination. However, the proponent considers the risk is low because all water from the mine pit will be pumped out and sent to the fine tailings pond and then to the polishing pond for treatment before being discharged to Lake Jean.

Effects on water quantity: modification of the hydrologic regime

The mine infrastructure will encroach on eight lakes and a number of their outlets and tributaries, which will be permanently lost. The tributaries of Lake Denis will also be lost as a result of the construction of ditches designed to protect the lake from potential contaminants.

The construction of dikes for storage of process water will reduce the water level of Lake Jean by 3 to 4 cm during the pre-production phase and first few years of production. Starting in the fifth year, Lake Jean should gradually return to its natural level of approximately 100 cm.

Mine pit pumping could also alter the local flow regime by lowering the level of the water table around the periphery of the pit. According to the hydrogeological modelling carried out by the proponent, there will be minimal water table drawdown, and there should be no effect on lakes located more than 500 m from the pit.

7.2.2 Mitigation measures

The proponent has agreed to implement a number of mitigation measures (see Appendix 2) to reduce the risk of impact on surface and groundwater, including the following:

- From the outset, the proponent intends to store process water and to recycle it throughout the production phase in order to limit the quantity of pumped water. All will be treated and gradually returned to the receiving environment.
- To reduce the risk of releases of contaminated runoff to the environment, the proponent intends to install a system of ditches at specific sites on the property to collect water from the mine site. The water in contact with ore, equipment, waste rock, or tailings will be treated before it is discharged to the receiving environment to ensure that it meets the criteria of Directive 019 and the standards of the MMER.⁴
- The risk of chemical contamination will be reduced through the use of explosives containing less soluble-ammonia, the establishment of buffer zones on each side of the railway right-of-way, and the installation of hydraulic traps in the event of the detection of contamination.
- To reduce sediment loading to streams, the proponent intends to install sediment traps, to protect stream banks by leaving vegetation or stumps in place, and to cover exposed areas with mulch.

7.2.3 Government, public and Aboriginal comments

The members of the Cree communities voiced concerns about the risks of leaching and discharge of contaminated water to the environment.

The federal committee raised questions about the water management plan and update, the risk of discharge of untreated water, particularly during the pre-production phase, the presence of a toxic form of vanadium, and the toxicity of the tailings.

The proponent provided the federal committee with details on the water management plan and update, including the pre-production period. The plan, which calls for collection ditches at certain locations around the mine, should limit the risk of discharge of contaminated water to the environment. With respect to the waste rock dump, the plan does not call for collection ditches. However, the proponent is of the view that the water will naturally flow towards the Lake Jean sub-watershed, where it will be treated prior to discharge to the environment. During the construction phase, a system for intercepting sediments and solids (Geotube®) will be used before building the ditches.

The proponent has an obligation to ensure that all water coming into contact with the operations area (as defined by the MMER) is collected and treated prior to discharge to the environment. The proponent has agreed to take the necessary measures to ensure that all water management activities will be carried out in the Lake Jean watershed.

⁴ See excerpts from Directive 019 and MMER in Appendix 6.

The proponent has an obligation to ensure that all water coming into contact with the operations area (as defined by the MMER) is collected and treated prior to discharge to the environment.

According to studies by the proponent, the toxic form of vanadium is not found at the mine site. It plans to monitor the quality of the final effluent and the receiving environment in accordance with the requirements of the MMER. In addition to the monitoring requirements of the MMER, Environment Canada has asked the proponent to monitor total effluent aluminum, chromium and vanadium concentrations at the same testing frequency as set out in sections 12 and 13 of the MMER.

Natural Resources Canada (NRCAN) raised a number of questions about the validity of the hydrogeological modelling, particularly the potential hydraulic connections with water bodies. The elements provided by the proponent show that there is a fault line at the northern end of the mine pit that could potentially represent a hydraulic connection with Lake A-2. On NRCAN's recommendation, the proponent has agreed to monitor the water level of Lake A-2. In the event of a hydraulic connection between the mine pit and a water body, the proponent undertakes to seal any major leaks by injecting grout into the cracks.

The provincial Administrator has asked the proponent to submit reports on the monitoring of the geochemical characteristics of the mine waste and surface and groundwater quality, as well as details on the chemicals used.

7.2.4 Agency conclusions on the significance of residual environmental effects

The Agency is of the view that the residual effects of the project on water quality will be minor given that the mine waste is not leachable or acid-generating and that an effluent collection and treatment system will be installed. This system was designed to meet the requirements of Directive 019 and the MMER. The water quantity and quality monitoring program will be carried out throughout the duration of the mine site operations and following mine closure. It will make it possible to quickly detect any changes in this valued component that could be attributable to the project and to make the necessary changes.

The planned sediment and erosion control measures will significantly reduce sediment loading. Under the MMER, monthly mean concentration of suspended solids in effluent deposited cannot exceed 15 mg/L. Once the proposed water treatment measures are in place, the deposit of mine effluent should not result in increased downstream sediment metal concentrations.

With respect to the effects on water quantity, the original flow will be permanently altered by the presence of the mine infrastructure. However, the loss of water bodies will be limited to the Lake Jean and Lake A-1 sub-watersheds and will be restricted to small, shallow water bodies with low productivity. All process water withdrawn from the environment will be returned to Lake Jean at the end of operations.

Taking into account the implementation of mitigation measures by the proponent and the compliance with the regulatory requirements respecting mine effluents, the Agency concludes that the project should not cause significant adverse environmental effects on water resources.

7.3 Air quality

This section addresses issues relating to air quality, including atmospheric dispersion of particulate matter and greenhouse gas emissions (GHGs).

Current ambient air quality around the proposed mine and railway sites can be described as good. The existing sources of atmospheric emissions are low and are primarily the result of mine exploration activities, forestry operations, and wind erosion.

7.3.1 Potential environmental effects

The potential adverse environmental effects on air quality are associated with emissions of particulates, gaseous compounds, and GHGs generated by mine operations (ore extraction and processing), including drilling activities, borrow pits, use of generators and explosives, traffic at the site, transport and storage of ore, coarse tailings and waste rock, and activities associated with the construction, operation and decommissioning of the railway line.

Emissions of particulates, metals and gaseous compounds

The proponent performed atmospheric dispersion modelling to assess the potential air quality effects of emissions of particulates (total particulates and fine particulates), gaseous compounds (Sulphur dioxide, Nitrogen oxide and Carbon monoxide) and 14 metals and metalloids present in mine

waste. Three modelling scenarios were developed corresponding to site preparation, mine start-up, and peak operations. For each scenario, the various point sources (crusher, concentrator, exhaust, etc.), surface sources (waste rock dump, coarse tailings stockpile, and coarse tailings disposal area), and volume sources (drilling, blasting, loading, unloading, etc.) were identified and considered. The environmental effects described below correspond to the identified residual effects, since the modelling takes account of mitigation measures described in Section 7.3.2.

The modelling results generally show that the project will not generate particulate or gaseous emissions exceeding the standards set out in the Quebec *Clean Air Regulation*.⁵ Some exceedances of total particulate and chromium emissions are anticipated during start-up and peak operations. The proponent is of the view that the exceedances will be low and infrequent, i.e., one to two days a year. With respect to the sector northeast of the mine pit, exceedances could occur on approximately 10 days a year.

Exceedances during start-up of mine operations are due to the total tonnages, which are substantial, even though it is the start of mine production, and to the fact that the operations will be at the surface. Exceedances are anticipated south of Lake Denis, south of the divide between Lake Saint-Jean and James Bay. According to the proponent, no human activity has been identified at that location. The exceedances would not affect the streams or water bodies. Exceedances of the standards during peak operations are due to the quantity of ore being processed and are expected to occur in the area north of Lake Armitage, Lake Bernadette, in the Lake Jean area, and in an area south of the mine site. All of these predicted exceedances are located within 2 to 3 km of the centre of the mine operations.

⁵ For mine projects, compliance with ambient air quality standards must be assessed at a distance of approximately 300 m from ore extraction and processing facilities located on public lands.

Greenhouse gases emissions

The proponent has also conducted an assessment of direct GHG emissions associated with the project. The estimated emissions are those from sources controlled by the proponent, such as the combustion of fossil fuels by mobile equipment, the use of generators, and the use of explosives. The proponent estimates that, over the course of its life cycle, the project will generate 12 megatonnes of carbon dioxide equivalent (MtCO₂eq) GHG, the majority of which is associated with rail transport of ore concentrate. These emissions, which total close to 53,000 tCO₂eq per year, place the project in the category of GHG emitters that must submit a report to Environment Canada under the Greenhouse Gas Reporting Program. The project will also be subject to mandatory reporting at the provincial level, where the threshold is 10,000 tCO₂eq per year.

7.3.2 Mitigation measures

The proponent agrees to implement various measures (see Appendix 2) to reduce the adverse environmental effects on air quality, including the use of dust suppressants and road surface materials with very low silt content to reduce dust in the air.

To reduce GHG emissions, the proponent recommends the use of the “low idle” feature for locomotives, which allows the engine to idle at a reduced speed. The proponent has also agreed to take energy efficiency into account when purchasing new or replacement equipment, favouring the best technologies available on the market in terms of energy consumption.

7.3.3 Government, public and Aboriginal comments

Environment Canada raised a number of issues aimed at clarifying the atmospheric dispersion modelling. A number of uncertainties remain

despite the supplemental information provided by the proponent. The federal committee is of the view that the estimated 95% reduction in dust emissions used in the atmospheric dispersion modelling is overly optimistic and that the predicted concentrations of airborne contaminants may have been underestimated.

The Cree communities have asked that an air quality monitoring program be implemented. The proponent may have to implement such a program in order to meet the requirements of the provincial certificate of authorization issued by the provincial administrator and make adjustments to the mitigation measures in the event that there is a real impact on air quality.

7.3.4 Agency conclusions on the significance of residual environmental effects

Although the proponent has agreed to implement mitigation measures to bring contaminant emissions below the regulatory limits, there may be a number of infrequent, small exceedances. Any exceedances are expected to occur relatively close to the project infrastructure and at locations where no human activity has been identified. To ensure that the project meets the provincial regulations, the provincial administrator has required additional modelling of atmospheric emissions, and, if necessary, additional mitigation measures and follow-up.

The Agency recognizes that the emission rates from rail transport are low relative to the level of GHG emissions that would have been produced by trucking.

Taking into account the requirements of the provincial administrator and the implementation of the mitigation measures, the Agency concludes that the project is not likely to cause significant adverse effects on air quality.

7.4 Fish and fish habitat

Fish habitat in the local study area, which includes the Lake Jean sub-watershed, is characterized by the presence of shallow lakes showing signs of eutrophication and severe low-water levels and by slow-flowing streams with a fine organic substrate. Such characteristics limit the productivity of these water bodies for fisheries, but are favourable to the development of aquatic grassbeds. The bodies of water and the floodplains bordering them provide spawning, nursery, foraging and refuge habitat for Northern pike, yellow perch and cyprinids.

At the head of the Lake Jean sub-watershed, the proponent has observed sections of streams with a more dynamic flow. This is the sector in which brook trout completes its entire life cycle, particularly lakes B-12 and B-14 and their outlets and tributaries. Appendix 8 presents the list of lakes, tributaries, and outlets that will be affected by the project as well as their characteristics in terms of area, fish species present, and functions.

The characterization of crossing sites along the rail route concludes that the outlet of Lake Jules is the only stream that provides fish habitat. Experimental fisheries carried out in this stream have confirmed the presence of walleye, yellow perch, burbot, mottled sculpin, and sucker. With the diversity of habitats found in the stream, this sector provides spawning, nursery and foraging grounds for these species.

No fish species that are at risk or in decline occur in the local study area.

7.4.1 Potential environmental effects

The physical works and activities associated with the project that are likely to result in serious harm or mortality of fish relate to encroachment of infrastructure on habitat, changes in water flows, sediment loading, and blasting activities.

Serious harm to fish and fish habitat

During the construction phase, it is estimated that there will be a total loss of 249,800 m² of fish habitat (see Table 3). The footprint of the mine infrastructure on the aquatic environment will result in the loss of lakes and streams located upstream of Lake Jean and Lake A-1, which will have to be added to Schedule 2 of the *Metal Mining Effluent Regulations* as mine waste disposal sites (see Appendix 8). Moreover, the construction of the railway bridge at the outlet of Lake Jules will destroy a part of the floodplain.

The construction of holding ponds upstream of Lake Jean will result in changes to the flow regime during the pre-production phase and first four years of operation. The main tributary of Lake Jean, downstream of the treatment pond, will dry up completely or, at a minimum, will experience extreme low-flow conditions. After this period, Lake Jean and its tributary should gradually return to natural conditions.

There is a risk that a number of construction and operation activities, including site preparation and construction of stream crossings, will cause runoff of fine sediment to the aquatic environment. It is known that sediment loading to the aquatic environment can cause adverse effects to fish at different stages of their life cycle. Fine sediment can settle on spawning grounds, smothering the eggs or even making the spawning grounds unsuitable for reproduction. It can also irritate fish gills and harm fish movements by reducing water transparency.

During the construction and operation phases, these activities will result in declines in available oxygen in Lake Jean in summer, owing to a longer lake renewal time, particularly during low-flow periods.

Table 3 Overview of effects on fish habitat

Effect on fish and fish habitat	Nature of loss	Area (m ²)
Permanent encroachment (subject to MMER)	Destruction by waste rock discharge to lakes B-11, B 12, B-13, and B-14, to two ponds northwest of Lake B14, and to permanent streams.	63,700
	Destruction by tailings and waste rock discharge to lakes B-3, B-6, and B-7 and to permanent streams, and by the creation of ponds (polishing, treatment and monitoring).	49,000
	Destruction by coarse tailings discharge to Lake B-1, to a section of its outlet, and to a roughly 160-linear-metre section of the outlet of Lake Denis.	3,800
Permanent encroachment (subject to paragraph 35(2)(b) of the <i>Fisheries Act</i>)	Destruction by encroachment of the dike of the treatment and monitoring pond on the outlet of Lake B-3.	500
	Destruction by encroachment of railway bridge abutments in the floodplain of the outlet of Lake Jules.	1,400
Changes in water flows (subject to paragraph 35(2)(b) of the <i>Fisheries Act</i>)	Loss of productivity in Lake Denis, a section of its outlet, and permanent sections of its two tributaries.	54,400
	Temporary drying up of the tributary of Lake Jean and of littoral habitats and wetlands located around Lake Jean.	77,000
Subtotal of losses associated with the addition of water bodies to Schedule 2 of the MMER		116,500 m ²
Subtotal of losses to be authorized under paragraph 35(2)(b) of the <i>Fisheries Act</i>		133,300 m ²
TOTAL loss		249,800 m²

Fish mortality

The construction of the dikes upstream of Lake Jean for the holding ponds will result in fish mortality. With the exception of Lake Denis, all streams and water bodies located upstream of these dikes will be destroyed (see Figure 2). The fish population of Lake Denis will be confined, and some species could disappear since all of the lake’s hydrological connections will be destroyed. In addition, Fisheries and Oceans Canada considers that blasting operations carried out for the construction of the railway line will cause fish mortality, particularly near the outlet of Lake Jules.

7.4.2 Mitigation measures

The proponent has agreed to implement numerous mitigation measures to reduce the adverse environmental effects on fish and fish habitat (see Appendix 2). It has proposed a compensation plan to offset the loss of 116,500 m² of fish habitat due to the discharge of harmful substances

to waters frequented by fish. In addition, in its application for authorization to carry out works, undertakings, or activities causing serious harm to fish, the proponent will have to provide Fisheries and Oceans Canada and implement another compensation plan for 133,300 m² of habitat.

The proponent will establish a construction activity schedule to comply with the restriction period for activities in water in order to protect spring spawning and limit fish mortality.

The proponent will take specific measures during holding-pond dike construction to limit fish mortality, including the installation of fish barriers. The proponent will establish a construction activity schedule to comply with the restriction period for activities in water in order to protect spring spawning and limit fish mortality.

The work methods for the construction of stream crossings, particularly at the site of the railway bridge at the outlet of Lake Jules, will be such that the size of the work areas will be limited and the equipment will be kept as far away from the aquatic environment as possible.

7.4.3 Government, public and Aboriginal comments

The Aboriginal groups consulted expressed concerns about the harmful alteration of fish habitat by sediment loading and by the discharge of mining effluent to neighbouring streams. They are concerned about the impact this could have on traditional fishing activities and fish consumption.

Fish habitat losses totalling 116,500 m² are associated with the destruction of streams and water bodies due to accumulation of discharged mine waste. These streams and water bodies, which are listed in Appendix 8, will have to be added to Schedule 2 of the MMER. Fisheries and Oceans Canada has determined that an authorization under paragraph 35(2)(b) of the *Fisheries Act* will be required for serious harm to fish over an area of approximately 133,300 m² of fish habitat.

In accordance with the MMER requirements, the proponent has proposed a compensation plan to offset fish habitat losses associated with the addition of the water bodies to the MMER. The plan includes measures identified in the Quebec Department of Energy and Resources' recovery plan for the lake trout population of Lake Chibougamau.

All serious harm to fish will have to be authorized and the proponent will have to propose and implement another compensation plan. The details of the second plan will be finalized in collaboration with Fisheries and Oceans Canada, which will have to approve the plan prior to issuing an authorization under the *Fisheries Act*.

To address the concerns of the Aboriginal communities, Fisheries and Oceans Canada is requiring that the proponent take measures, in addition to the mitigation measures it has proposed, to control erosion and sediment transport in the aquatic environment. Fisheries and Oceans Canada has determined that the restriction period for activities in water will be from April 15 to June 15 in order to protect spring spawning. In addition, it will have to conduct its blasting activities in accordance with the *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky, 1998).

Taking into account the implementation of the proposed mitigation measures (see Appendix 2) and the implementation of a compensation plan to offset the loss of productive capacity for fisheries resources, Fisheries and Oceans Canada considers the effects of the project on fish are acceptable.

7.4.4 Agency conclusions on the significance of residual environmental effects

The Agency notes that the anticipated effects of the project on fish and fish habitat will be limited to the Lake Jean and Lake A-1 sub-watersheds, and that all habitat losses will be offset by the proponent. Taking into account all proposed mitigation measures, the Agency is of the view that the project is not likely to cause significant adverse environmental effects on fish or fish habitat.

7.5 Birds and bird habitat

This component includes land birds and water birds, as well as their habitat, namely forests, wetlands and open areas, and water bodies.

According to the proponent, the local study area and its vicinity are likely to be frequented by 145 bird species every year, most of which are migratory species. In bird surveys conducted by the proponent in the local study area in the spring of 2012, 54 species of land birds were recorded, including white-throated sparrow, woodpeckers, passerines, and grouse. The surveys also confirmed the presence of four species listed under the *Species at Risk Act*, namely Canada warbler, common nighthawk, olive-sided flycatcher, and rusty blackbird. Seven raptor species were recorded during the breeding period, including osprey and bald eagle. The latter is protected under the *Quebec Act Respecting Threatened or Vulnerable Species*.

With respect to water birds, the proponent recorded 18 species of ducks and geese and 5 species of shorebird, as well as common loon, herring gull, Great blue heron and belted kingfisher.

7.5.1 Potential environmental effects

Activities associated with the construction, operation, and closure of the mine and railway will result in impacts on birds and their habitat, primarily due to losses of terrestrial and wetland areas caused by forest clearing, mineral extraction, handling and storage of various materials, use and circulation of machinery, and train movements within the rail corridor.

The proponent has estimated that the construction of the mine complex and railway line will result in a loss of approximately 1,200 ha of terrestrial habitat, primarily in closed coniferous forests and regenerating stands, as well as roughly 200 ha of

wetlands. These losses will likely affect between 2,300 and 5,350 breeding pairs. It estimates that between 5 and 24 breeding pairs of ducks and geese will be affected by the loss of 13 ha of aquatic habitat.⁶ Between 3 and 18 breeding shorebird pairs are likely to be affected by the project, primarily in large peat bogs with pools.

Habitat losses associated with the project are likely to affect the four identified species at risk that use the area as breeding habitat. The proponent estimates that these habitat losses could affect as many as some 20 breeding pairs of Canada warbler, primarily in mature deciduous and mixed stands and mixed regenerating stands. There is a risk that 40 breeding pairs of olive-sided flycatcher could also be affected, primarily in the shrub swamps and riparian fens. With respect to the rusty blackbird, the proponent estimates that 3 to 17 breeding pairs could be affected, primarily in the shrub marshes and swamps and in peat bogs with pools of over 5 ha. Owing to the large variety of potential common nighthawk habitats, the proponent was unable to provide an estimate of the number of breeding pairs that could be affected by the project.

In addition to habitat loss, there is a risk that a number of bird nests will be destroyed during the construction phase as a result of the clearing of trees and other vegetation and of the removal of overburden.

The treatment ponds will contain all water collected at the mine site, and they may contain harmful substances. Water birds could be attracted to these ponds and use them. The proponent has assessed the ecotoxicological risk to migrating birds that use these treatment ponds to be low. It indicates that the anticipated toxicity level in the ponds is low because the tests revealed a low risk of acid drainage and metal leaching.

⁶ Appendix 7 presents a detailed description of the losses of various types of wetlands and the relative areas they represent within the local study area of the mine site and the restricted study area of the railway line.

Lastly, there is a risk that noise and traffic generated by construction, development and operation activities will cause disturbance to birds. Noise is a potential source of stress that can lead to behavioural changes affecting bird feeding and breeding.

7.5.2 Mitigation measures

The proponent agrees to implement a number of mitigation measures (see Appendix 2) to reduce the adverse environmental effects on birds and their habitat.

To offset habitat loss, the proponent has committed to develop and implement a compensation plan for wetlands, which will reduce the anticipated impacts on birds and their habitat. The proponent has also agreed to give priority to areas already developed and to use areas characterized by wetlands only as a last resort.

The proponent will plan its work schedule such that forest clearing, grubbing, and overburden removal will be carried out outside the breeding period, which runs from April 21 to August 15. Mitigation measures will also be taken to reduce disturbance to bird populations caused by noise generated by the mining operations, such as limiting machinery traffic and restricting the use of back-up alarms.

7.5.3 Government, public and Aboriginal comments

Environment Canada asked the proponent to supplement its analysis of the effects of the project on species at risk by assessing potential habitat loss and alteration as well as the number of breeding pairs that will potentially be affected. In response to Environment Canada's comments, the proponent clarified its commitment to mitigate the effects on species at risk. For example, it will

implement an environmental monitoring program to protect migratory birds, including species at risk, that may occur within the project perimeter. The program will include measures to prevent the harming or disturbance of birds and their nests and eggs, as well as the establishment of a buffer zone around any nests that are discovered.

Environment Canada is of the view that some uncertainty remains as to the proponent's conclusions on the low ecotoxicological risk of bird use of ponds in which mine effluent is held prior to treatment. If necessary, the proponent will have to examine various options in order to meet Section 5.1 of the *Migratory Birds Convention Act, 1994* (MBCA), which prohibits the deposit of a substance harmful to migratory birds in waters or an area frequented by migratory birds or in a place from which the substances may enter such waters or such an area.

At the request of Environment Canada, the proponent committed to add a migratory bird component to his environmental monitoring program, to avoid any impact during construction. The program should include measures designed to prevent harm or disturbance to birds and their nests and eggs, particularly during the breeding period. A management plan in the event of migratory bird mortalities or the observation of abnormal bird behaviour will have to be developed. Should such incidents or situations occur, the proponent should take appropriate corrective measures. In addition, once the revegetation work is completed, migratory bird monitoring (particularly species at risk) will have to be carried out to validate the effectiveness of site restoration.

The Agency received no comments from the public or Aboriginal communities on this component.

7.5.4 Agency conclusions on the significance of residual environmental effects

The Agency is of the view that bird habitat losses are not likely to cause significant effects on healthy, resilient bird populations. Given the widespread availability of similar habitats in the region in which the project will take place, it is likely that these bird populations will successfully become established elsewhere. Rusty blackbird, olive-sided flycatcher, Canada warbler, and common nighthawk, four species listed in Schedule 1 of the *Species at Risk Act*, will experience habitat losses during the construction of the mine site. The anticipated effects on at-risk bird species should be mitigated by the availability of similar habitat in the study area, the wetlands compensation plan provided for by the proponent, and revegetation of exposed soils as soon as possible (or at the time of site closure/rehabilitation).

The Agency is of the view that the implementation of mitigation measures should significantly reduce bird nest destruction and disturbance to birds caused by noise generated by the construction activities.

Taking into account the commitments by the proponent and the implementation of mitigation measures, the Agency concludes that the project is not likely to cause significant adverse environmental effects on birds or their habitat.

7.6 Terrestrial wildlife and their habitat

For the purposes of this report, the terrestrial wildlife and habitat component covers reptiles and amphibians, mammals (fur-bearing animals, small and large mammals), and their habitat.

The proponent documented the presence of terrestrial wildlife using existing sources, traditional knowledge, and direct observations during various periods of fieldwork.

Numerous water bodies and other wetlands in the local study area provide suitable favourable habitat for several species of amphibians and reptiles. The proponent has confirmed the presence of wood frog, northern leopard frog, American toad, and eastern newt.

The proponent has also confirmed the presence of many mammal species, including moose, black bear, wolf, beaver, and snowshoe hare. It is likely that some 15 furbearing species sought after by traditional users of the land also occur in the local study area, including muskrat, American marten, mink, fisher, and short-tailed weasel. Other small mammal species, such as mice, voles, shrews, and several species of bats, are also potentially present.

Of the large mammals, moose is the species most sought by traditional users of the area. Winter moose habitats were identified in the northern sector of the local study area (mountain in which the deposit is located) and in the sector between Lake Denis and Lake Monette. Moose also occurs at the mine site in summer.

Woodland caribou is listed as threatened under the *Species at Risk Act*. However, according to the woodland caribou distribution map produced by the Quebec Department of Energy and Natural Resources, the local study area is located outside the range of this species (MDDEFP, 2013). As a result, it is unlikely to occur within the local study area.

Five mammal species listed under the Quebec *Act Respecting Vulnerable or Threatened Species* are likely to occur in the local study area and its immediate vicinity, namely rock vole, silver-haired bat, red bat, hoary bat and southern bog lemming.

7.6.1 Potential environmental effects

The primary potential impacts on terrestrial wildlife are associated with habitat loss as well as disturbance and mortality caused by the construction, operation, and closure of the mine.

Habitat loss

The construction of the mine infrastructure will result in a loss of approximately 1,200 ha of terrestrial habitats, or less than 2% of the local study area. According to the proponent, habitats in the local study area are regenerating following intensive logging that took place some 30 years ago and are now primarily in the immature forest stage. The majority of the habitats at the mine site will be permanently lost. Moose winter and foraging potential habitat on the periphery of the mine site could be partially or totally lost. However the extend of these losses may vary considering that mooses do not use the same area from one year to the next. It will be possible to recover part of the habitat affected through the planned post-closure restoration measures.

The impact on most terrestrial species will be limited because they can relocate to similar habitats. The movement of several wildlife

species outside of the work area could result in increased density of these species on the periphery as well as increased predation.

Disturbance and mortality of terrestrial wildlife

The increased road transport and traffic and the use of the new railway line associated with the project will pose a risk of mortality to wildlife, such as moose, snowshoe hare and black bear, due to collisions. The proponent plans to make one rail shipment per day, which will limit the impacts.

Noise generated by the use of machinery, construction of the railway line, traffic, and activities associated with operations at the mine site could disturb terrestrial wildlife. The feeding, breeding and rearing behaviour of some species could be disturbed within a few kilometres of the mine site.

7.6.2 Mitigation measures

To limit the adverse effects of the project on terrestrial wildlife, the proponent agrees to take various measures, some of which are designed to reduce habitat loss. They include indicating a forest clearing boundary on the construction plans and installing markers to protect wooded areas adjacent to the work sites. The proponent will ensure that machinery traffic is restricted to the preferred routes within the area of operations.

The proponent also committed to conduct a survey to confirm the extend of winter moose habitat losses. If after the survey winter habitat is disturbed by the construction of the infrastructure, the proponent undertakes to carry out compensation.

Additional measures designed to limit disturbance to terrestrial wildlife will be taken, including grouping all construction site trailers and machinery storage areas at the temporary workers camp and raising worker awareness of sound waste management at the construction site.

7.6.3 *Government, public and Aboriginal comments*

The Cree community of Oujé-Bougoumou expressed concerns about the impact of the project on large game species, such as moose, as the future mine pit will be located in its foraging habitat. The impact of noise from traffic and blasting operations on furbearing species and woodland caribou is also a source of concern.

The Cree community of Oujé-Bougoumou expressed concerns about the impact of the project on large game species, such as moose, as the future mine pit will be located in its foraging habitat.

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

Despite the application of all of the mitigation associated with terrestrial wildlife, the project will cause permanent habitat loss, primarily in the sectors of the tailings pond and mine pit. However, the integrity of the populations will not be compromised given the widespread availability of suitable habitat in the study area, the limited extent of the loss and planned compensation works. A number of species may relocate to other similar habitats.

Considering the implementation of the mitigation measures and the limited extent of the impact, the Agency considers disturbance to terrestrial wildlife due to noise to be negligible.

The Agency is of the view that wildlife mortality due to collisions will be restricted to the areas of the rail and road corridors and will not affect a large number of individuals. As a result, there will be no noticeable change to the integrity of the terrestrial wildlife population at the local study area scale.

Considering the proponent's commitments to implement mitigation measures, the Agency concludes that the project is not likely to cause significant adverse environmental effects on terrestrial wildlife or habitat.

7.7 **Current use of land and resources for traditional purposes**

This section addresses the effects of the project on the current use of land and resources by the Aboriginal communities for traditional purposes as well as on structures, sites or things that are of historical, archaeological, paleontological or architectural significance.

The predominant traditional activities in the area in which the BlackRock project is located are hunting, fishing, trapping, and gathering by the Cree of Oujé-Bougoumou and Mistissini.

The main users of the local study area are the members of a family from the community of Oujé-Bougoumou that operates trapline O-59, which covers an area of close to 100,000 ha. That family has been using the area, including the mountain in which the deposit is located, for several generations to harvest wildlife resources, gather certain plants, and draw source water. The primary activity carried out in the area is moose and migratory bird hunting, as well as trapping of furbearing species, such as beaver, weasel

and lynx. A base camp (camp Rabbit) is located along access road 210, roughly 12 km west of the proposed mine site. Used primarily in fall and winter, it comprises a number of buildings located on either side of a road, as well as a drinking water intake in an adjacent stream.

Other traditional users of the land in the local study area, including two families from the community of Mistissini, operate traplines M/O 57 and O-59. Another family from Oujé-Bougoumou operates trapline O-60, which is located just outside of the local study area.

An archaeological study cited by the proponent (Archéos 2002) has revealed the presence of a single known archaeological site (DkFn-1) located on the east shore of Lake Chibougamau, roughly 8 km from the mine site. That study identified some 15 potential sites along Forest Road 210, in the watershed of Lake Armitage and the Armitage River, and around lakes Jean and Bernadette. The findings of surveys carried out by the proponent in the summer of 2011 at the identified sites did not find any signs of archaeological potential.

Interviews conducted by the proponent with the users of traplines O-59 and M/O-57 provided relevant information, including the location of former camps, burial grounds, trails, and portages. The members of the Cree communities who were consulted identified a large number of former camp sites, some of which have historical value and reflect their attachment to the land.

7.7.1 Potential environmental effects

The construction of mine and railway infrastructure will involve a loss of land use by users of trapline O-59. Close to 1,200 ha, or roughly 1% of the trapline, will be impacted by the project. The location of the mine pit will, among other things, destroy the mountain in which the deposit is found, which is an area of historical and cultural value and a significant area for moose hunting.

The use of the Rabbit hunt camp, a site of cultural value where traditional Cree activities are carried out, will be affected primarily by truck traffic on Forest Road 210. The entire area between the Canadian National railway line and the mine site will be affected by the intensive mine activities, thereby reducing other possible uses of the area.

The mine infrastructure and road and rail traffic will have an effect on the safety and accessibility of the hunting, fishing, and gathering camps of a family from the community of Oujé-Bougoumou that operates trapline O-59. The train running on the existing railway line could also cause accidents and disturb the members of the Innu community of Pekuakamiulnuatsh Takuhikan.

The impact of dust settling on the ground and in streams could contaminate traditional food. The noise could also disturb the traditional users of the land and could drive away the wildlife that is hunted and trapped in the local study area.

The surveys conducted in the areas of archaeological potential confirmed the absence of artefacts or objects of historical or prehistoric value. According to the proponent, the project will, in all likelihood, have no impact on archaeology.

7.7.2 Mitigation measures

The proponent undertakes to implement a number of mitigation measures (see Appendix 2) to reduce the adverse effects on the use of land and resources for traditional purposes. Before the work begins, it will relocate the Rabbit hunt camp to offset the loss of the use of trapline O-59. The proponent has specifically undertaken to limit the risk of accidents to traditional users of the land that could be caused by traffic on the mine site by informing the tallyman of trapline O-59 of the schedule of work and activities that could have an impact on safety. The proponent will also implement standards designed to reduce noise associated with the use of machinery.

A number of mitigation measures that concern the other valued components addressed in this report, including air quality, water quality, and terrestrial, avian, and aquatic species, will contribute to mitigating the effects of the project on the current use of land and resources for traditional purposes.

7.7.3 Government, public and Aboriginal comments

The Oujé-Bougoumou band council indicated that it is satisfied with the answers provided by the proponent in addressing the concerns of the trappers and the community as a whole. At the Agency's request, the proponent held additional consultations with the community of Mistissini, which indicated that a number of its members were unhappy with the consultations by the proponent on the use of the land.

The Cree communities of Oujé-Bougoumou and Mistissini and the Innu community of Pekuakamiulnuatsh Takuhikan have concerns about the potential impacts of the project on air and water quality and on traditional hunting, fishing, and trapping activities. The consumption of potentially contaminated traditional food is a very important health issue for the communities in light of previous contamination of water plans caused by past mining activities in the region. Health Canada is of the view that the proponent could have assessed the risk of health impacts on users. The proponent feels that compliance with the applicable standards for air and water quality, to which it has committed, will reduce the risk of contamination.

The community of Pekuakamiulnuatsh Takuhikan has concerns about the risk of accidents and noise resulting from the train using the Canadian National railway line that runs through the reserve. The proponent has indicated that the use of the existing railway line will meet the applicable safety standards. According to the proponent, one train shipment per day should not have a significant additional impact on the community.

7.7.4 Agency conclusions on the significance of residual environmental effects

The loss of traditional use of approximately 1,200 ha of land is a significant issue associated with this valued component. The Agency is of the view that there will be residual environmental effects due to the permanent loss of certain sectors. However, it feels that this loss will not compromise the use of the land for traditional purposes given the small size of the area affected (1% of the trapline O-59).

Mitigation measures designed to minimize and offset the impacts on wetlands and winter moose habitat will reduce the adverse effects on the traditional hunting, fishing, trapping, and gathering activities of the Cree of Oujé-Bougoumou and Mistissini. In addition, the relocation of the Rabbit hunt camp will ensure continuity of land use.

Despite the standard mitigation measures planned, the Agency is of the view that there will continue to be a low risk of accidents due to traffic, as well as residual effects on the traditional use of land due to noise.

With respect to the risk of contamination of traditional food, the Agency is of the opinion that with the conditions issued by the provincial Administrator in its certificate of authorization requiring monitoring of fish populations and contamination of fish tissue, the proponent's commitment to meet the air and water quality standards, the development of a communications strategy with the Aboriginal communities, and the establishment of a monitoring committee, it will be possible to properly monitor the situation and to develop solutions, as required, to minimize the health risks to the population.

The Agency is of the view that the participation of Cree communities in the monitoring committee established by the proponent will allow them to monitor the unfolding of the project and the

implementation of the mitigation measures, will contribute to reducing the impacts on land use. Moreover, the talleyman will collaborate on the winter moose habitat surveys and on the measures designed to compensate for disturbed habitats that will be taken by the proponent.

Considering the mitigation measures that will be taken by the proponent, the participation of the Cree in the monitoring committee, and the monitoring and follow-up requirements of the province, the Agency concludes that the project is not likely to cause significant adverse environmental effects on the current use of land and resources for traditional purposes or on structures, sites or things that are of historical, archaeological, 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. The cumulative effects assessment is based on the proponent's analyses and on the Agency's Operational Policy Statement (2007).⁷ The purpose of the cumulative effects assessment is to determine the extent to which the residual environmental effects of the BlackRock project on a valued component will combine with the effects of other physical activities that have been or will be carried out.

7.8.1 Scope

The methodological approach used by the proponent for the cumulative effects assessment consists of the following steps:

- identification of valued components, determination of the spatial and temporal boundaries considered for each component, and description of the indicators used;
- identification of the projects, actions, or events that may have affected the valued components, that is currently affecting them, or that will affect them;
- description of the reference state of each valued component and the historical trends;
- identification of the cumulative effects for each valued component selected.

To determine whether the project, in combination with other past, present or reasonably foreseeable projects and/or activities, could result in cumulative environmental effects, the environmental assessment focused on the valued components for which residual effects are anticipated. The cumulative effects assessment covered the following valued components: water resources, traditional land use, avian species, species at risk, and wetlands.

For all valued components selected for the cumulative effects assessment, the proponent determined that the spatial boundaries of the cumulative effects assessment covered the greater Chibougamau region, including the traditional territory of the community of Oujé-Bougoumou. The temporal boundaries are from the second half of the 20th century to approximately 15 years after the end of the mine and railway operations.

⁷ Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act (2007).

<http://www.acee-ceaa.gc.ca/default.asp?lang=En&n=1F77F3C2-1>

The other past or future physical activities that were taken into account in the cumulative effects assessment can be grouped into four categories: mining industry, electricity infrastructure, forestry activities, and sanitary landfills and contaminated sites.

- **Mining industry:** Some 30 mines have been developed in the last 60 years. The oldest mines in the region date to 1955. Now closed, they left behind large amounts of waste due to obsolete practices. The projects that were active in the region—namely the Grandroy, Copper Cliff, Copper Rand, Merrill, Cedar Bay, Jaculet, Bruneau, Portage, and Henderson mines—are essentially located near Lake Doré, adjacent to the west shore of Lake Chibougamau. The only mine in the local study area was the Lemoine mine. That mine was closed and the site was restored in the early 1990s. According to the Quebec Department of Energy and Natural Resources, although exploration is currently being carried out in the region, no other mining projects are being considered in the short or medium term.
- **Electricity infrastructure:** Since phase 1 of the La Grande complex came online in the early 1980s, three Hydro-Quebec transformer stations have been built in the region, namely the Chibougamau, Obalski and Obatogamau stations. The region also has ten 735-kilovolt (kV) transmission lines, one 450-kV transmission line, one 350-kV transmission line, and numerous 161-kV transmission lines. These power transmission and distribution lines result in fragmentation of the area. There is also a possibility of a wind energy project by Eeyou Power in the area. However, its implementation is not yet certain and was therefore not taken into account in the assessment.

- **Forestry activities:** Since the early 1950s, the overall biophysical environment of the Chibougamau region has been altered by forestry activities. Chantiers Chibougamau Inc. is currently logging forests north of Lake Chibougamau. To the east and south, large-scale logging is winding down. Forestry operations had impacts on the local study area roughly 30 years ago and the forests affected are now in the immature stage. Like mining activities, logging can result in an increase in nutrients and sediment loadings to lakes and streams. Forest cover disturbance is likely to lead to increased methylation of mercury in water bodies.
- **Sanitary landfills and contaminated sites:** There are two authorized sanitary landfills in operation: the Chibougamau landfill and the Chapais landfill. The Chibougamau landfill is located northeast of the municipality, on Merrill Road. The Chapais landfill is adjacent to the former Opémiska mine. The contaminated sites inventory of MDDELCC contains 17 sites in the Chibougamau region. They contain primarily hydrocarbon-contaminated soil.

7.8.2 Potential cumulative effects

Water resources

The lakes and streams have historically been used largely for mining operations. The lake most affected in the local study area is Lake Chibougamau. The BlackRock project does not involve any activities that could increase pressure on the lake.

In the Lake Jean sub-watershed, there are no past or anticipated future activities whose effects could be combined with those of the BlackRock project. The main residual effect of the project on water resources is its encroachment on a number of lakes

and streams in the Lake Jean and Lake A-1 sub-watersheds. At the local-study-area scale, this effect could act cumulatively with the residual effects of the Lemoine mine. Given the advanced state of restoration at this mine site and the fact that most encroachment is limited to a single sub-watershed, the cumulative effect is low.

Traditional use of the territory

The BlackRock project has a residual effect on the traditional use of trapline O-59, essentially owing to the loss of approximately 1,200 ha, some of which cannot be restored. The potential sources of cumulative effects are the former Lemoine mine, logging operations and the proposed transmission line to supply electricity to the BlackRock mine. However, these effects are insignificant given the restoration of the Lemoine site, the limited footprint of the transmission line on the trapline, and the fact that logging in this sector ended 30 years ago. Moreover, there appears to be no plans for any similar projects at this time.

Avian species, species at risk, and wetlands

Forest clearing and loss of wetlands required for the BlackRock project combined with the other resource development activities in the region could have impacts on avian species. However, with the planned mitigation measures, the restoration of wetlands and the large size of the forested area in which the project is located, the cumulative effect on birds will be limited.

With respect to species at risk, a cumulative effect with past forestry activities and the Lemoine mine is possible. However, the Agency is of the view that this effect will be low given the extent of site regeneration and habitat restoration in the local study area.

7.8.3 Mitigation measures

In view of the unlikelihood that the project will cause significant cumulative effects, no additional measures apart from those designed to mitigate the effects of the project as described in Schedule 2 were identified as being required to mitigate cumulative effects.

7.8.4 Government, public and Aboriginal comments

During the consultations in July 2013, the communities requested that the proponent take the possible mine expansion into account in its cumulative effects assessment. According to the proponent, the feasibility of expanding the operation has not yet been determined. The Agency feels that the possible expansion of the site is, at this point, hypothetical. The cumulative effects assessment must take certain or reasonably foreseeable future projects into account.⁸ However, it should be noted that the possible expansion of the project towards the southern deposit was taken into account by the proponent in the design of the tailings pond. Such an expansion should have a limited footprint since various existing infrastructure will be used. Such an expansion could have an impact on a Lake Armitage site that is valued by Aboriginal groups, who should be fully informed and consulted on any development of the site.

According to the Cree Nation Government, trapline O-59, which is affected by the development of the municipality of Chibougamau, has already been impacted by various mining and forestry projects.

⁸ Addressing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act*, 2007.

<http://www.acee-ceaa.gc.ca/default.asp?lang=En&n=1F77F3C2-1>

7.8.5 Agency conclusions on the significance of residual environmental effects

The Agency is of the view that the project could result in adverse cumulative effects on water resources, use of the land for traditional purposes, bird species, and species at risk. However, given the mitigation measures provided for as part of the project, the restoration of the Lemoine site and the fact that logging operations in the local study area was halted 30 years ago, the Agency concludes that the project is not likely to cause significant cumulative environmental effects.

7.9 Effects of the environment on the project

Under the former Act, any change to the project that may be caused by the environment must be taken into account in the identification of environmental effects. The proponent has examined the effects of the environment on the project and has proposed measures designed to reduce them.

7.9.1 Potential effects

The effects of the environment on the project may be related to precipitation, seismic activity and forest fires.

With regard to precipitation, the proponent reports that the Ouranos study on climate change (2010) predicts a gradual increase in winter temperatures and precipitation by 2050. This would result in increased snowfall in the region. The increased precipitation and freeze-thaw cycles could potentially increase mine water flows in winter and could also lead to increased runoff from the tailings pond and an increased risk of dike failure.

With regard to the risk of seismic activity, the proponent states that the project region is located in a relatively stable zone.

However, according to the Atlas of Canada (Natural Resources Canada 2009), the forest fire risk assessment, based on climate conditions and vegetation type, shows that the area affected by the project is located in an area of low or moderate forest fire potential.

7.9.2 Mitigation measures

The proponent has taken the influence of climate conditions into account in designing its project. It has factored extreme rainfall and extreme climate conditions into the planning and management of the tailings pond, including by designing a water treatment plant of adequate capacity.

The proponent has also indicated that, to ensure complete impermeability, all dikes will be built with an internal wall consisting of a waterproof bituminous membrane. The dikes will be designed according to the stability criteria of the Quebec Department of Energy and Natural Resources.

7.9.3 Comments from the government, the public and Aboriginal groups

Members of the public participating in consultations held by the proponent expressed concerns about the quality and solidity of the membranes and dikes. The proponent agreed to monitor the stability of the retaining dikes. The monitoring program must allow appropriate adjustments to be made to prevent adverse events. To facilitate monitoring, water pressure levels will be measured in the dikes by piezometers, and monitoring wells around the tailings ponds will be used for periodic groundwater sampling.

At the request of the federal committee, the proponent has provided a broad outline of its emergency plan, which takes extreme situations into account. The plan will evolve as activities are carried out at the site, and the proponent has undertaken to update it annually.

The analysis by Natural Resources Canada confirms that the probability of a major earthquake occurring in this region is low to nil.

7.9.4 Conclusions of the Agency on the significance of the residual environmental effects

The Agency believes that the proponent has taken environmental effects into account in the design of its project to an appropriate extent, thus reducing the risks of potential effects of the environment on the project. Given the implementation of the environmental monitoring program, mitigation measures and emergency measures by the proponent, the Agency concludes that the environmental conditions are not likely to cause significant adverse effects on the project.

7.10 Effects of potential accidents or malfunctions

Environmental effects caused by accidents or malfunctions are among the elements to be examined under the former Act. The proponent has identified the activities most likely to cause accidents or malfunctions during the mine construction and operation phases, the potential adverse environmental effects, and the planned measures for responding to emergencies.

7.10.1 Potential effects

Risks related to environmental aspects and to health and safety were inventoried in order to develop a strategy for minimizing the occurrence of these accidents and minimizing the impacts of unavoidable accidents. The proponent has identified the following activities that pose a high environmental risk: road construction; petroleum product transport, handling and storage; management of the tailings and polishing ponds; and management of reagents and hazardous substances and waste.

Among these activities, the proponent has identified possible accidents and malfunctions, most of which have significant potential consequences according to the methodology commonly used to assess environmental risks in mining operations (see Appendix 10). They are as follows:

- an oil spill during road construction or during transport of petroleum products, raw materials or ore;
- uncontrolled emissions of chemicals related to reagent transport;
- a discharge of liquids due to management of the tailings or polishing ponds (including dike failure);
- a fire or explosion during reagent handling;
- a process water reservoir leak, and
- a sewage spill.

7.10.2 Mitigation measures

The activities for which a technological malfunction or accident could have high or moderate environmental consequences will be considered priorities for ensuring monitoring on a more continuous basis. To that end, the first step in prevention is compliance with the applicable environmental protection acts and regulations. An environmental compliance audit program will be implemented by the proponent to verify the enforcement of the acts and regulations.

The proponent has also developed a risk management program that includes all measures designed to reduce the risk of accidents or malfunctions. It has therefore made a commitment to focus on high-level engineering criteria, the installation of high-performing equipment and warning systems, and the implementation of management rules to reduce risks of incidents throughout all phases of the project.

Despite the many precautions that will be taken to reduce risks, the proponent acknowledges that some accidents are nonetheless likely to occur. It has therefore made a commitment to develop an emergency plan setting out response criteria, response procedures and the location of emergency equipment at each high-, moderate- or low-risk site. The emergency plan will be kept up-to-date and communicated to employees.

The proponent indicates that all employees will receive at least one information session per year on the emergency plan, and that it will focus on prevention through employee training and awareness. It indicates that this will foster a rapid, effective, timely response in the event of a disaster or spill that could have consequences for the environment. In the event of an oil spill or a discharge of any other harmful substance, the proponent will promptly call the emergency hotlines of Environment Canada and Environment Quebec (Environmental Emergency).

7.10.3 Comments of the government, the public and Aboriginal groups

The federal committee believes that the proponent's risk management program and commitment to produce an environmental audit program will reduce the probability of occurrence of accidents and malfunctions. The federal committee also believes that in the event of an accidental spill, the emergency measures and response established by the proponent will reduce the environmental effects.

It has therefore made a commitment to develop an emergency plan setting out response criteria, response procedures and the location of emergency equipment at each high-, moderate- or low-risk site.

7.10.4 Agency's conclusions on the significance of the residual environmental effects

The Agency believes that the proponent has identified and assessed the potential accidents and malfunctions associated with the project. The Agency notes that the project was designed in such a way as to prevent such scenarios and that emergency and response plans would be in place in the event of an accident. Overall, the Agency believes that the probability of occurrence of accidents and malfunctions that could have significant adverse residual effects is low.

7.11 Effects on the capacity of renewable resources

Pursuant to the requirements of subsection 16(2) of the former Act, the Agency must consider the capacity of renewable resources significantly affected by the project to meet the needs of the present without compromising the ability of future generations to meet their own needs.

The environmental impact statement contains a detailed assessment of the potential effects of the project on renewable resources, water, terrestrial animals, birds and fish. Special attention was paid to water resources, fish and fish habitat, birds and other wildlife species.

The effects of the project on each of those resources were assessed in accordance with the scope of the project assessment (see sections 7.2, 7.4, 7.5 and 7.6). The significance of the residual effects was also assessed. 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 access potable water 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 unlikely to cause significant adverse environmental effects on the capacity of renewable resources.

8. Follow-up Program Under The Canadian Environmental Assessment Act

Under 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, the responsible authority, must ensure that a follow-up program is developed and implemented to its satisfaction with the support of federal authorities. Other follow-up measures may be required by authorizations potentially issued by the federal government.

In its environmental impact statement, the proponent makes a commitment to perform follow-up on mine effluents, surface and groundwater, terrestrial, avian and aquatic animals, the noise environment, air quality, and dike stability. It also states its plans to create a follow-up committee with the participation of the public and Aboriginal communities.

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 identified additional follow-up requirements. These requirements were determined on the basis of the nature of the project's potential environmental effects, uncertainties with regard to predictions or to the effectiveness of the mitigation measures, and the concerns raised by the public and Aboriginal groups.

In its environmental impact statement, the proponent makes a commitment to perform follow-up on mine effluents, surface and groundwater, terrestrial, avian and aquatic animals, the noise environment, air quality, and dike stability.

8.1 Water resources

Monitoring of the quality of treated effluent and the receiving environment is required to ensure that the planned mitigation measures enable the proponent to meet the regulatory requirements of the *Metal Mining Effluent Regulations* (MMER). Under the MMER, the proponent must conduct environmental effects monitoring to study the effects of effluent on fish, fish habitat and the use of fish resources. Effluent characterization is conducted by analyzing a sample of effluent and recording the hardness, alkalinity, electrical conductivity and temperature of the sample, as well as the concentrations, expressed as total values, of the following parameters: aluminum, cadmium, iron, mercury, molybdenum, selenium, ammonia and nitrate.

In addition to the monitoring requirements prescribed in the MMER, the quality of treated effluent and the receiving environment will also be monitored in terms of total concentrations of aluminum, chromium and vanadium. Monitoring is required because those chemicals are likely to be present in mine tailings. Monitoring will make it possible to prevent such chemicals from contaminating water resources. The duration of the monitoring will be assessed on the basis of the results obtained and will be reviewed as needed.

Lastly, the proponent has undertaken to monitor water levels in Lake A-2, since a fault at the north end of the pit could provide a hydraulic link with that lake. If a hydraulic connection is observed between the pit and a water body, the proponent agrees to plug major leaks by filling the cracks with grout.

8.2 Fish and fish habitat

Monitoring is required in order to ensure compliance with requirements related to the issuance of authorizations under the *Fisheries Act*. The proponent must meet the compensation objectives that are set, confirm the integrity and effectiveness of compensation developments, and take corrective measures where warranted according to the monitoring results.

8.3 Birds and bird habitat

After carrying out revegetation work during the mine closure phase, the proponent will carry out monitoring of migratory birds, particularly species at risk, to validate the effectiveness of the site restoration. More specifically, the proponent will have to compare the results obtained at control sites (baseline) with migratory bird diversity and abundance in the developed sectors. As the basis for comparison, it will have to use estimates of terrestrial bird and shorebird breeding pair losses, by species and habitat, as presented in section 7.5.1.

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

8.4 Current use of land and resources for traditional purposes

Consumption of potentially contaminated traditional food is a health issue that is important to the communities, in light of the contamination of fish following past mining activities in the region. Consequently, the proponent will have to keep the Aboriginal communities informed of the results of the traditional food contamination risk monitoring program using a variety of channels of communication, including the monitoring committee, band councils, and the websites of the proponent and communities.

The proponent has undertaken to prepare an inventory of winter moose habitat in trapline O-59. Once the inventory is complete, the proponent will have to carry out compensation if winter habitat is disturbed by infrastructure construction. In that event, the proponent will have to monitor the quality of the replacement winter habitat.

Lastly, the proponent will regularly consult traditional users of the area to monitor noise levels around the site in order to detect problems and quickly apply solutions.

Table 4 Federal monitoring program elements

Valued component	Program elements
Water resources	Monitoring of the quality of the treated effluent and receiving environment on the basis of the MMER requirements. Monitoring of total concentrations of chromium and vanadium.
	Monitoring of water levels in Lake A-2 throughout the entire project life cycle.
Fish and fish habitat	Monitoring of the established compensation objectives and the integrity and effectiveness of the compensatory works.
Birds and bird habitat	Monitoring of migratory birds, particularly species at risk, to validate the effectiveness of the site restoration.
	Production of environmental monitoring reports during the construction phase of the project, to document the presence of nests of migratory birds and species at risk, as well as the actions taken to ensure their protection.
Current use of lands for traditional purposes	Monitoring of risks of contamination of traditional food to respond to concerns raised by Aboriginal communities.
	Monitoring of winter moose habitat quality.
	Monitoring of noise in consultation with traditional users of the area.

Government agencies will participate in developing the elements of the monitoring program corresponding to their respective mandate and expertise. The program will take into account the conditions and requirements set out in the federal and provincial authorizations required for implementing the project, potential changes affecting environmental conditions, and

environmental effects that could arise during the implementation of the project. The results of the monitoring program will be communicated to the agencies concerned. The results, or instructions on how to obtain the results, will be posted on the Canadian Environmental Assessment Registry (www.ceaa-acee.gc.ca).

9. Benefits of environmental assessment

The environmental assessment process makes it possible to consider improvements to the environmental performance of a project, starting at the planning phase, and to reduce its adverse impacts on the environment while making them more socially acceptable. These benefits will benefit both current and future generations.

In collaboration with the federal committee, the Agency has assessed the potential effects of the project on the valued components and has considered the contributions of the public and Aboriginal groups who expressed themselves during the consultations.

In examining project alternatives, as well as methods for mitigating any potentially adverse impact, the environmental assessment helps improve the design of projects. For example, in the case of the BlackRock project, the proponent opted for a water supply system that allows closed-loop recycling of 90% of the process water. The proponent also chose an access road that allows for greater road safety and a lesser impact on streams and hunting and fishing activities.

The proponent opted to transport the ore to the existing Canadian National (CN) line by rail rather than road, which is more polluting and hazardous. This change to the project will significantly reduce its direct GHG emissions.

The proponent's implementation of the mitigation measures and a monitoring program will prevent or reduce adverse environmental effects on a number of valued components, including the water treatment system, the installation of which will substantially mitigate the project's effects on water resources.

Following discussions with Environment Canada, the proponent decided not to dump waste rock in a water body to create waste rock platforms. This decision will reduce the extent of fish habitat losses. The proponent has also developed a fish habitat compensation plan in collaboration with Fisheries and Oceans Canada and Cree communities. These measures will substantially reduce the project's impacts on fish and fish habitat.

A number of major issues were raised during consultations with Aboriginal communities, and measures have been identified for responding to them. For example, the proponent decided not to use the Armitage River, given its importance as a particularly productive hunting and fishing ground for the Cree, and it has undertaken to include Aboriginal individuals on the monitoring committee it plans to create. These measures will reduce the project's adverse effects on the use of the area for traditional purposes.

10. Conclusion 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, the Cree Nations of Oujé-Bougoumou and Mistissini, and the Innu Nation of Pekuakamiulnuatsh Takuhikan;
- the proponent's obligations, as set out in the certificate of authorization issued pursuant to the Quebec *Environment Quality Act*; and
- the obligation to obtain authorization under the *Fisheries Act* for work that will cause the loss or disturbance of fish or fish habitat and for the storage of mine waste in waters frequented by fish.

Taking into account the implementation of the proposed mitigation measures and the commitments made by the proponent, the Agency concludes that the project is unlikely to have significant adverse environmental effects.

Taking into account the implementation of the proposed mitigation measures and the commitments made by the proponent, the Agency concludes that the project is unlikely to have significant adverse environmental effects. Following a public consultation on this report, the Minister of the Environment will decide, taking into account the proposed mitigation measures, whether the project is likely to cause significant adverse environmental effects.

The project will then be referred back to the responsible authority, Fisheries and Oceans Canada, for a decision under section 37 of the former Act. This section states that, where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is not likely to cause significant adverse environmental effects, or the project is likely to cause significant adverse environmental effects that can be justified in the circumstances, the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part. On the other hand, where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is likely to cause significant adverse environmental effects that cannot be justified in the circumstances, the responsible authority shall not exercise any power or perform any duty or function conferred on it by or under any Act of Parliament that would permit the project to be carried out in whole or in part.

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12. Appendices

Appendix 1

Summary of Proponent's Assessment of Alternative Means

Activity	Alternatives	Benefits	Drawbacks
Location of production facilities, crusher and processing plant	A The processing plant and crusher are located northeast of Lake Denis	Advantageous site for depositing waste rock and coarse tailings	Large amount of overburden to remove; conveyors interfere with truck movements; soil mechanics are unsuitable
	B The processing plant and crusher are located southeast of Lake Denis	No benefit identified	Geomechanical properties of soil are unsatisfactory (bedrock too deep); located above a potentially mineralized fault that is a priority target of another mining company; claims not belonging to BlackRock
	C The processing plant and crusher are located southeast of Lake Denis, slightly further west than option B	No benefit identified	Located on the extension of the same potentially mineralized fault as in option B; riskier operation since the plant is located lower than the tailings pond (pump lines must go up sheer walls to reach the fine tailings pond); large volume of rock to be excavated, very costly as a result
	D The processing plant is located southeast of Lake Denis, slightly further south than option C (Alternative selected)	Site is sufficiently far away from the potentially mineralized fault to avoid impacts; soil geomechanical properties are satisfactory; footprint is minimal; reduces traffic and CO ₂ emissions; little overburden to remove; location is within BlackRock's claims	No drawbacks identified
Process water supply	A Installation of a process water intake at the outlet of Lake Armitage or on the Armitage River	Lake Armitage meets the MDDELCC criterion for minimum flow	The Armitage River watershed is a site valued by the tallyman of trapline O-59; importance of site for Lake Chibougamau walleye spawning
	B Dikes around fine tailings pond and polishing pond water recycling (Alternative selected)	Minimizes freshwater needs since 90% of the process water is recycled in a closed loop and 10% of the residual water comes from precipitation; minimal footprint; suitable support of the environment of low productivity; avoids affecting the Armitage River	Loss of fish habitat

Summary of Proponent's Assessment of Alternative Means continued

Activity	Alternatives	Benefits	Drawbacks
Tailings ponds and waste rock dumps	Scenario 1 (see Figure 7)	Fewer wetlands affected; less CO ₂ emitted in relation to the amount of diesel burned; streams destroyed are less long; lower operating costs than other scenarios; only one fish species living in the destroyed streams highly valued by the Cree.	Spreading out of infrastructure (affected site footprint); nine or more pumping stations required; higher capital investment and restoration costs than scenarios 2 and 3; little flexibility with regard to the possibility of expanding the project; one water body affected by freshwater pumping.
	Scenario 2 (see Figure 4) (Alternative selected)	Option with the least spreading-out of infrastructure (affected site footprint), shorter access road, fewer stream crossings, effects concentrated in one watershed; no freshwater flow required during the start-up and operation phases; fewer pumping stations required (fewer than four); less effluent to monitor upon closure; economically advantageous (lower investment and restoration costs required); only one traditional hunting territory affected (compared with two in the other scenarios); possibility of expansion if necessary; only one hunting ground affected, compared with two in the other scenarios.	Option with the greatest amount of wetlands affected; bodies of water containing fish and habitat destroyed; sections of streams destroyed; most costly compensation plan.
	Scenario 3 (see Figure 8)	No freshwater flow required during the start-up and operation phases; shorter access road; less effluent to monitor upon closure; economically advantageous (lower investment and restoration costs required); possibility of expansion if necessary	Spreading out of infrastructure (affected site footprint); area of water bodies containing fish and habitat destroyed; scenario with the second-greatest amount of wetlands affected; more stream crossings (six); sections of streams destroyed; one water body affected by freshwater pumping.
	Scenario 4 (see Figure 9)	Small amount of lakes containing fish and habitat destroyed; smaller amount of streams destroyed; least costly compensation plan	Spreading out of infrastructure (affected site footprint); more stream crossings (six); higher capital investment and restoration costs than scenarios 2 and 3; little flexibility with regard to the possibility of expanding the project

Summary of Proponent's Assessment of Alternative Means continued

Activity	Alternatives	Benefits	Drawbacks
Work camp	<p>A</p> <p>Lemoine Road camp is located on a recently cleared lot along Lemoine Road, approximately 420 m from the intersection with Forest Road 210</p>	<p>Located some distance away from heavy traffic and the anticipated negative effects (noise, dust, road safety); no need to drive 6 km along the access road used by tractor trailers</p>	<p>Irregular moraine landscape; a small tributary to Lake Stella (and to the Armitage River) starts south of the camp location; site grading encroaches on a wetland; use of Lemoine Road adds to the environmental footprint and partly interferes with other possible uses of the road and sector</p>
	<p>B</p> <p>Forest Road 210 camp is located approximately 3 km east of Option 1 (Alternative selected)</p>	<p>Recently cleared level moraine landscape; poor drainage; sufficiently large surface to meet basic needs without encroaching on sensitive environments; site 2 to 3 km closer than the previous option, which is a not insignificant factor since a shuttle bus will have to transport several hundred workers between the camp and the mine site every day</p>	<p>Some negative effects anticipated (noise, dust, safety) but will be mitigated</p>
<p>Access road segment 1 Forest Road 210</p>	<p>A</p> <p>Part of provincial Route 167 at km 200, west of Lake Pierre, and corresponds to Forest Road 210 (Alternative selected)</p>	<p>Has the desired 10-m-wide rolling surface and is in good repair; no construction work planned on this part of the access road, apart from routine maintenance, spot repairs to the rolling surface, and installation of adequate signage; the culverts are in good working order and allow free flow of water</p>	<p>Conflict between uses anticipated; the noise, dust and heavy traffic could affect the hunting camps located near lakes André and Guy; a spawning ground will have to be preserved</p>

Summary of Proponent's Assessment of Alternative Means continued

Activity	Alternatives	Benefits	Drawbacks
<p>Access road segment 2 Lemoine mine road</p>	<p>A Lemoine Road Approximately 19 km from Route 167, at the entrance to the municipality of Chibougamau</p>	<p>Site is easy to access; no significant environmental impact is anticipated</p>	<p>Increased risk for road safety and traffic flow: the existing road is winding, needs to be expanded and restored, includes four major curves before joining the road segment 3, and crosses three streams</p>
	<p>B Lake France Road Starts 21.9 km from Route 167, along Forest Road 210, and is 2.9 km further than Option A (Alternative selected)</p>	<p>No significant environmental impact is anticipated; road alignment is safer because it is straight and allows for good traffic flow; regular topography that is higher than the surrounding wetlands, except along Forest Road 210; includes only one curve where it joins Forest Road 210; no stream crossings</p>	<p>The alignment crosses 100 m of a wetland; repercussions on the hunting and fishing grounds and on other potential uses (extensive tourism); mining rights in this sector are held by Ressources Cogitore, a company based in Rouyn-Noranda</p>
<p>Access road segment 3 Lake Denis road</p>	<p>A Lake Denis road starts south of Lake Yvette and runs along its eastern shore (Alternative selected)</p>	<p>Shorter road alignment (about 4 km); fewer stream crossings (only one small stream that drains to Lake Denis)</p>	<p>Repercussions on the hunting and fishing grounds and on other potential uses (extensive tourism, vacation resorts)</p>
	<p>B Lake Bernadette road is located in the extension of Lemoine Road</p>	<p>No benefit identified</p>	<p>Longer alignment (about 4.5 km); crosses three small streams; crosses moose winter habitat; crosses the southwest portion of the deposit that extends towards Lake Armitage</p>

Figure 7: Tailings ponds and waste rock dumps: Scenario 1

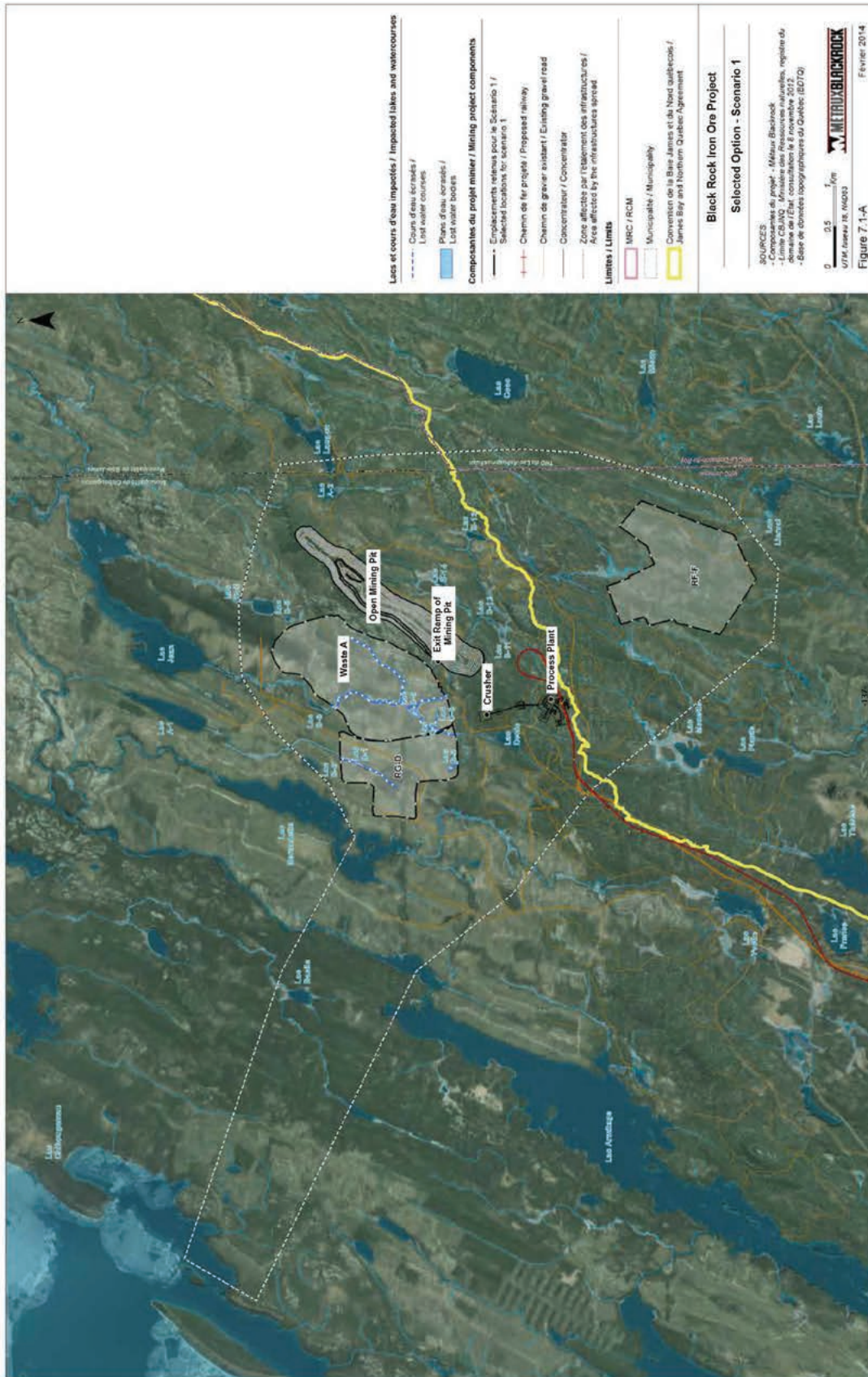
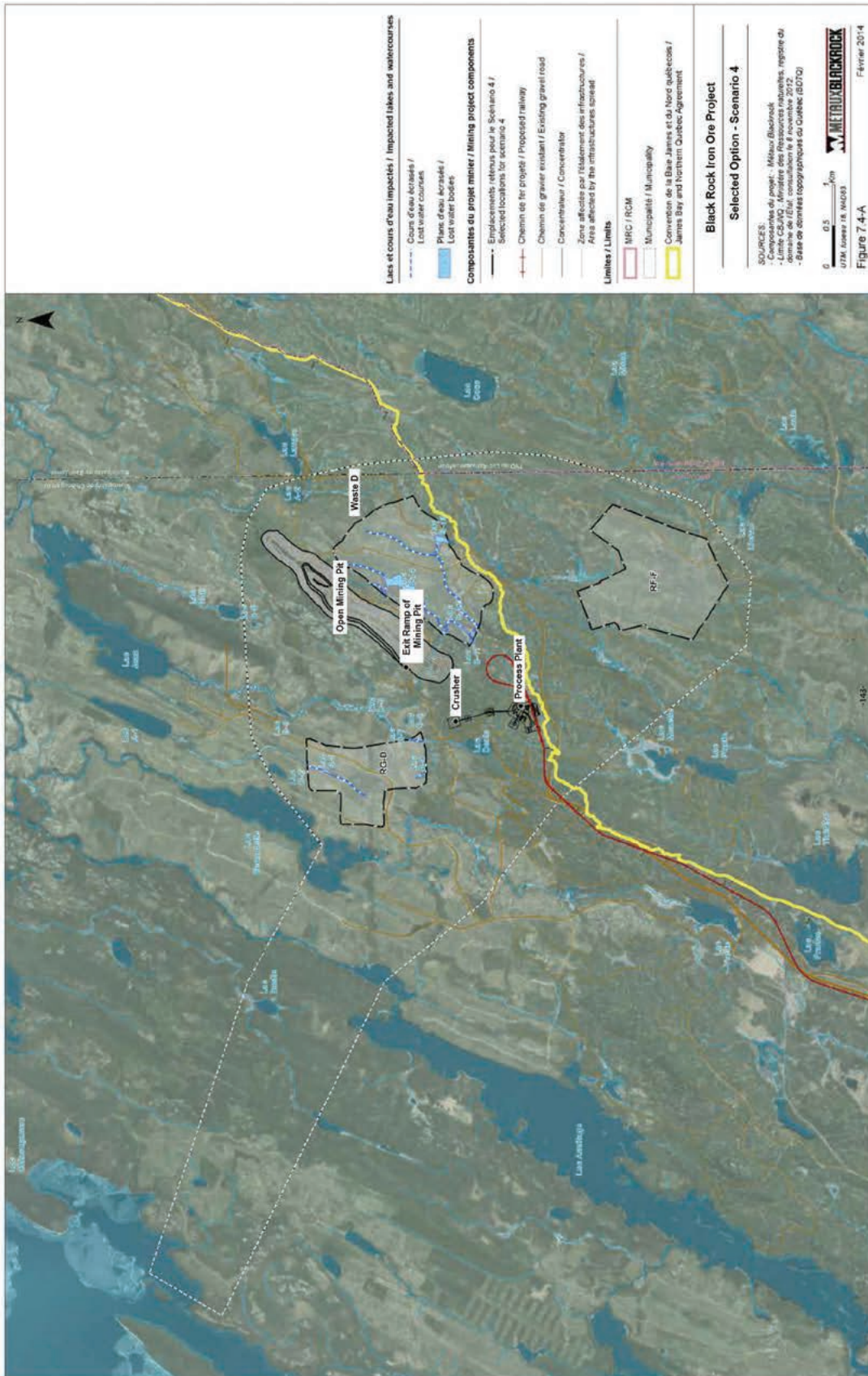


Figure 9: Tailings ponds and waste rock dumps: Scenario 4



Appendix 2

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 BlackRock project. The proponent committed to implement all these measures.

To avoid repetition, some mitigation measures in a section may apply to more than one valued component. Note that other mitigation measures may be prescribed in authorizations potentially issued by the federal government.

Water resources

- Store the process water at the start of the project, recycle it throughout the operation phase and gradually released it into the receiving environment, to limit the amount of water pumped into the environment.
- Implement a water management system, including collection ditches, the polishing pond, and water treatment and monitoring before release into the receiving environment.
- Install wastewater collection tanks on the lower floors of each work structure, including the crusher, ore transfer tower, processing plant, electrical substation and garage. These collection tanks will allow particulate matter to settle and will be connected to hydrocarbon traps. The water collected in the tanks should be checked to ensure that it is free of hydrocarbons before it is sent to the treatment and monitoring pond.
- Preserve a 1-m buffer zone on each side of the railway right-of-way during chemical weeding activities in order to minimize the impact on water bodies, streams and wetlands.
- Implement an explosives management plan to reduce the presence of nitrogen compounds at the mine site.
- Use explosives containing less water-soluble ammonia, such as TITAN XL 1000, in minimal amounts, to reduce explosive contaminants at the source.
- Isolate the construction area in the stream from the rest of the stream to work “dry” and prevent suspension of sediments.
- Use coarse uncontaminated material, if a cofferdam is installed, to avoid increasing suspended solids.
- Install temporary sediment traps or other devices in reworked slopes, along banks or in drainage ditches to prevent particle transport to streams. Direct runoff and drainage water to vegetated areas using berms or diversion ditches.
- Protect streambanks that could be damaged during construction by leaving in place the shrub and herbaceous layers, as well as stumps.
- Ensure that the work never obstructs a stream and, if necessary, clean the stream and remove any debris.
- Do not pile snow within 30 m of a stream.
- Seed bare surfaces that are vulnerable to erosion and cover with mulch or biodegradable mesh to prevent soil loss or infiltration and particle transport due to runoff.
- Cover the sides and bottom of the ditch with granular materials, seed the banks, install energy-dissipating sills at regular intervals, and install sediment traps in the stream.
- Ensure that the wastewater treatment and purification system at the workers’ camp is working properly and that workers are complying with the principles of hydrocarbon, chemical and waste management.
- Ensure that ditches, culverts and receiving streams can absorb the volume of drainage water at all times, including during flood events (1/25 years). When more than one culvert is needed, place one of them 15 to 30 cm lower than the others to concentrate the low flow.
- Install upstream and downstream inverts of each culvert at least 15 cm beneath the natural streambed or at a depth equivalent to one fifth of the culvert diameter. Culverts must be long enough to prevent fill from obstructing the openings and must be large enough in diameter to avoid impeding the natural flow.
- Cover the bottom of the temporary diversion channel of streams with a geotextile membrane and/or gravel.

Air quality

- Implement a site-wide dust emission management plan during the various phases of the project.
- Use regularly authorized dust suppressants, such as water, salt or salt solutions, on any surface capable of generating dust.
- Rinse salting equipment at the project site and direct the rinsing water to the treatment ponds or released on surfaces that have already been treated.
- Cover roads with ultra-low-silt materials (less than 5%) and maintain them rigorously.
- Cover fine tailings that could be transported by the wind with a layer of water and develop a gradual remediation program.
- Preserve a strip of woody vegetation around the tailings ponds to reduce the spread of dust.
- Use silos, hoppers or other ore or concentrate storage structures to avoid dust problems and to store materials in preparation for loading or transfer.
- Use covered or indoor conveyor belts.
- Use baghouses or electrostatic precipitators on point-source releases, such as the stacks of concentrate dryers.
- Cover stockpiles and other materials that could produce releases.
- Cease temporarily operations if weather conditions cause an unacceptable increase in the risk of major airborne particulate releases.
- Modulate the maximal speed of trucks during the days convenient to the uprising and to the distribution of dusts.
- Prohibit the burning of waste and woody debris at the work site during the construction of the rail line.
- Ensure that the trucks carrying construction materials to the work site are always fitted with a tarp to prevent aggregates, stones or other materials from being released to the ground or air during transport.
- Use the low-idle feature for locomotives, which allows the engine to idle at a reduced speed and consequently reduces the load from cooling fans and other parasitic equipment.
- Avoid letting vehicle engines idle, except diesel engines in winter.

- Restrict the use of the haulage roads to authorized vehicles.
- Take energy efficiency into account when purchasing new or replacement equipment by staying up to date on the most energy-saving technologies available on the market.
- Implement procedures to ensure the efficiency of the sampling and weather stations and take corrective action if the standards are exceeded.
- Keep vehicles and machinery in good working order to reduce air emissions.
- Promote rapid revegetation of exposed surfaces.

Fish and fish habitat

- Implement a compensation plan to offset fish habitat losses due to the release of tailings into waters frequented by fish. The compensation plan will include measures related to the recovery plan for the Lake Chibougamau lake trout population.
- Implement a compensation plan to offset serious harm to fish that must be authorized under paragraph 35(2)(b) of the *Fisheries Act*.
- Do not carry out operations in the water during the restriction period (April 15 to June 15) in order to protect spring spawning and limit fish mortality. Carry out the work during the summer or winter, when no spawning is occurring and the water is at its lowest level.
- Comply with the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) for blasting operations near fish habitat.
- Comply with the planning criteria and mitigation measures set out in the DFO document *Guidelines for Planning River Crossings in Quebec* (DFO 2012).
- Establish working methods at crossing of water bodies to limit the extent of the work areas and to keep them as far away from the aquatic environment as possible during the rail line construction and decommissioning phases.
- Take measures to limit fish mortality during the diking work required for the creation of the retention ponds.

- Implement an erosion- and sediment-control plan to minimize sediment loading to the aquatic environment in each phase of the project. The erosion- and sediment-control measures should be maintained until the disturbed soil is permanently stabilized. Regularly inspect and maintain the erosion- and sediment-control measures and structures during the work.

Birds and bird habitat

- Undertake felling, grubbing and overburden removal operations outside the period of April 21–August 15, to mitigate the project’s impact on birds in general. This period is the critical nesting season for a number of bird species in this sector.
- Use first developed areas and use sectors containing wetlands only as a last resort, to mitigate the impact on wetlands.
- Develop and apply a wetland compensation plan to limit the anticipated impact on birds and bird habitat.
- Restore gradually affected habitat
- Identify, with tallyman of trapline O-59, wetlands for which a restoration plan could be prepared.
- Restore streambanks disturbed by the culvert and bridge installation work during the construction of the railway line.
- Develop an environmental monitoring program that will be sent to Environment Canada for comment before its implementation to prevent any impact on migratory birds and species at risk. The program should also set out measures for preventing disturbance or harm to birds, nests or eggs during the nesting season, such as establishing a buffer zone around the nests of migratory birds that are identified.
- Dispose materials or debris from tree clearing operations (trees, stumps, shrubs, branches, brush, dead wood and other plant debris) at least 60 m away from the shores of a lake, stream, floodplain, marsh, swamp or peat bog.

- Preserve the vegetation bordering lakes, streams and access roads. No construction machinery or vehicles may enter a 30-m zone around lakes and along streams.
- Preserve the herbaceous layer, stumps and the root system of felled trees on the shores of streams and lakes, on steep slopes and in wetlands. Do not pile anything in those zones. Use low-ground-pressure equipment and keep to previously established paths. In those sensitive areas, plan for manual felling.
- Prohibited movement of equipment, except at the crossing sites necessary for carrying out excavation and for installing the rail infrastructure in wetlands.
- Do not clear trees in areas where the vegetation does not interfere with activities. During construction, protect preserved trees located on the edges of areas to be developed.
- Comply with subsection 5.1 of the Migratory Birds Convention Act, 1994 (MBCA), which prohibits the deposit of 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.
- See the noise mitigation measures in the section on terrestrial wildlife and their habitat.

Terrestrial wildlife and wildlife habitat

- Prepare an inventory of winter moose habitat. If the inventory confirms that winter habitat is disturbed by infrastructure construction, carry out compensatory work for moose habitat.
- Identify a tree-clearing boundary on the construction plans and install markers to protect adjacent wooded areas.
- Restrict machinery movement to established paths within the construction area and ensure that contractors and subcontractors keep to existing forest paths.
- Educate workers on waste management and on the importance of not feeding wildlife.

- Avoid using equipment that generates impulse noise.
- Minimize the use of back-up alarms.
- Include sound power as an additional selection criterion when procuring the noisiest equipment for the project.

Current use of lands and resources, and sites or things of archaeological, heritage and historical importance for traditional purposes

- Move the Rabbit hunting camp to a sector not affected by traffic.
- Confirm winter moose habitat really disturbed by infrastructure construction and carry out with the help of Tallyman, habitat to compensate losses.
- Notify the tallyman of the work period and the impact on soil use and on tallyman's safety. Before initiating railway construction, the proponent will provide the tallyman with a copy of the work schedule, including a description of the nature of the work (felling, blasting, excavation, etc.).
- Install signage at high-risk sites on the access road.
- Keep local users up to date on the anticipated schedule and location of the construction work in order to ensure user safety during more hazardous operations (e.g. blasting) and will establish any accommodations deemed necessary in agreement with users.

- Maintain any equipment that emits noise at nuisance levels. Ensure that equipment mufflers are always in good working order.
- Come to an agreement with hunting ground users affected by the project if noisy activities (e.g. use of helicopters or all-terrain vehicles) need to be reduced on certain parts of the territory during the waterfowl and moose hunting seasons.
- Develop a program to educate workers on the Cree culture and on the presence and land use of the users of traplines M/O-57 and O-59.
- Keep Aboriginal communities up to date on the results of the traditional food contamination risk monitoring program through various communication channels, including the monitoring committee, the band councils, and the websites of the proponent and communities.
- Develop an emergency plan that sets out the intervention criteria, response procedures, and location of emergency equipment at each high-, moderate- or low-risk site. The emergency plan will be kept up-to-date and distributed to employees.
- See the noise mitigation measures in the section on terrestrial wildlife and their habitat.

Appendix 3

Residual Effects Assessment Criteria

Assessment criterion		Degree of residual effect	
Intensity	Low	Moderate	High
The extent of the structural and functional changes that could be made to the valued component	The effect imperceptibly changes the quality, use or integrity of the component	The effect leads to a reduction in the quality or use of the component but does not compromise its environmental integrity	The effect endangers the environmental integrity of the component or substantially and irreversibly changes the component or its use
Extent	Isolated	Local	Regional
The spatial scope or radius of the effects on the valued component, and the proportion of a population that is affected	The extent of the impact is isolated; the effect on the component affects a small area or a few individuals	The extent is local; the effect on the component affects a limited portion of the territory or a limited proportion of its population	The extent is regional; the effect on the component affects a large area or a large proportion of its population
Duration	Short	Moderate	Long
The temporal dimension, i.e. the period of time for which the effects will affect the valued component. Includes intermittence	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 the construction work but stops within five years	The effect persists on a continuous or discontinuous basis for more than five years. This is often a permanent and irreversible effect
Probability of occurrence	Low	Moderate	High
The actual likelihood that an effect could affect the valued component	The effect is unlikely to occur or will occur only in the event of an accident	It is possible but not definite that an effect on the component will occur	An effect on the component will definitely occur

The significance of the effect encompasses the criteria of intensity, extent, duration and probability of occurrence. 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 judgment to be made on the significance of the effect according to a five-point scale: very high, high, moderate, low and very low.

Effects at the very high and high levels are considered significant, while effects at the moderate, low and very low levels are considered not significant.

Appendix 4

Combination of Criteria for Determining the Significance of Effects

Intensity	Extent	Duration	Probability of occurrence	Significance	Intensity	Extent	Duration	Probability of occurrence	Significance				
High	Regional	Long	High	Very high	Regional	Long	High	High	High				
			Moderate	Very high			Moderate	Moderate					
			Low	High			Low	Moderate					
		Moderate	High	Very high		Regional	High	High					
			Moderate	Very high			Moderate	Moderate					
			Moderate	High			Low	Moderate					
	Short	Moderate	Moderate	High	Regional	Short	Moderate	High	Moderate	Moderate			
			Moderate	High			Moderate	Moderate					
			Moderate	High			Low	Moderate					
	Local	Long	Long	Moderate	High	Local	Long	High	High	Moderate			
				Moderate	High			Moderate	Moderate				
				Moderate	High			Low	Moderate				
			Moderate	Moderate	Moderate		High	Local	Moderate	High	High	Moderate	
					Moderate		High			Moderate	Moderate		
					Moderate		High			Low	Moderate		
		Short	Moderate	Short	Moderate	High	Local	Short	High	High	Moderate		
					Moderate	High			Moderate	Moderate			
					Moderate	High			Low	Moderate			
				Long	Moderate	Moderate		High	Local	Long	Moderate	High	Moderate
						Moderate		High			Moderate	Moderate	
Point		Moderate	Moderate	High	Moderate	Point	Moderate	High	High	Moderate			
				Moderate	Moderate			Moderate	Moderate				
			Short	Short	High		Moderate	Point	Short	High	High	Moderate	
	Moderate				Moderate		Moderate			Moderate			
	Long	Moderate	High	Moderate	Point	Long	High	High	Moderate				
			Moderate	Moderate			Moderate	Moderate					
	Short	Short	High	Moderate	Point	Short	High	High	Moderate				
			Moderate	Moderate			Moderate	Moderate					

* Only residual impact with high to very high significance showed a significant effect as defined in the *Canadian Environmental Assessment Act*.

Source: Genivar, May 2013, page 38.

Intensity	Extent	Duration	Probability of occurrence	Significance
Low	Regional	Long	High	Moderate
			Moderate	Low
			Low	Low
		Moderate	High	Moderate
			Moderate	Low
			Low	Low
	Local	Short	High	Moderate
			Moderate	Low
			Low	Low
		Long	High	Low
			Moderate	Low
			Low	Low
Point	Moderate	Short	High	Very low
			Moderate	Low
			Low	Very low
		Long	High	Low
			Moderate	Low
			Low	Very low
	Short	Moderate	High	Low
			Moderate	Very low
			Low	Very low
		Short	High	Low
			Moderate	Very low
			Low	Very low

* Only residual impact with high to very high significance showed a significant effect as defined in the *Canadian Environmental Assessment Act*.

Source: Genivar, May 2013, page 38.

Appendix 5

Summary of the environmental effects of the project

According to the analysis of the environmental effects of the project realised by the Canadian Environmental Assessment Agency presented in Chapter 7.

Valued Component	Activities	Potential Effects	Summary of Mitigation Measures (See Appendix 2 for Details)	Residual Effects
Water resources	<ul style="list-style-type: none"> • Extraction – pit • Water management • Dikes • Drainage ditches • Tailings disposal 	<ul style="list-style-type: none"> • Modification of runoff, infiltration and flow regime 	<ul style="list-style-type: none"> • Ensure that ditches, culverts and receiving streams can absorb the volume of drainage water at all times, including during peak flow periods. • Install culverts in a manner that preserves the natural flow of the streams. • If a diversion channel is needed to temporarily divert a stream, cover the bottom of the temporary work with a geotextile membrane and/or gravel. 	<ul style="list-style-type: none"> • Permanent modification limited primarily to the Lake Jean sub watershed.
	<ul style="list-style-type: none"> • Water management • Drainage ditches • Dikes • Extraction – pit 	<ul style="list-style-type: none"> • Lowering of water levels in Lake Jean and Lake A-2 	<ul style="list-style-type: none"> • If a hydraulic connection forms between the pit and a water body, the proponent undertakes to plug major leaks by filling the cracks with grout. 	<ul style="list-style-type: none"> • Lowering of water levels in Lake Jean by 3 to 4 cm; levels should gradually return to normal starting in the fifth year of operation. • Risks for Lake A-2 are low.
	<ul style="list-style-type: none"> • Tree clearing and site preparation • Blasting, excavation and earthwork • Stream crossing 	<ul style="list-style-type: none"> • Increased sediment loading to streams and wetlands 	<ul style="list-style-type: none"> • Isolate the construction area in the stream from the rest of the stream to work “dry” and prevent suspension of sediment. • During earthwork, install temporary sediment traps. • Protect streambanks by leaving the shrub and herbaceous layers, as well as stumps, in place. • Seed exposed surfaces and cover with mulch or biodegradable mesh. • Cover the sides and bottom of the ditch with granular materials, when constructing the drainage ditches. 	<ul style="list-style-type: none"> • Minor, temporary sediment loading could occur in some streams, including the outlet of Lake Jules.

	Degree of Severity of Adverse Residual Effect				Significance of Residual Effect	Need for Monitoring
	Magnitude	Extent	Duration	Occurrence		
	Moderate	Local	Long	High	Moderate	<ul style="list-style-type: none"> • Monitoring is required in order to meet the provisions of the MMER. Monitoring is also required in order to verify the effectiveness of the mitigation measures. • Monitoring of the quality of treated effluent, surface water and groundwater. • Periodic monitoring of water levels in Lake A-2.
	Low	Isolated	Moderate	High	Very low	
	Low	Local	Short	Moderate	Very low	

Summary of the environmental effects of the project continued

Valued Component	Activities	Potential Effects	Summary of Mitigation Measures (See Appendix 2 for Details)	Residual Effects	
Water resources	<ul style="list-style-type: none"> • Tailings disposal • Extraction – pit 	<ul style="list-style-type: none"> • Loss of water bodies and streams through encroachment or dewatering 		<ul style="list-style-type: none"> • Permanent loss of 8 lakes and 16 tributaries and outlets, most of them located in one sub watershed. They are small and shallow, with limited productivity. 	
	<ul style="list-style-type: none"> • Transport and movement • Wastewater management 	<ul style="list-style-type: none"> • Risk of contamination by accidental spill 	<ul style="list-style-type: none"> • Maintain a hydraulic trap, if contamination is detected. • Emergency plan and risk management plan. 	<ul style="list-style-type: none"> • The effect is unlikely to occur, and if it does, its magnitude, extent and duration will be limited by the mitigation measures, including the risk management plan and emergency plan. 	
	<ul style="list-style-type: none"> • Tailings disposal • Water management • Blasting 	<ul style="list-style-type: none"> • Contamination by leachate or by wastewater and explosives 	<ul style="list-style-type: none"> • At the end of operations, open the dikes in a downstream-to-upstream direction once the water quality meets the established standards. • Ensure that wastewater is collected and treated. • Use explosives containing less water-soluble ammonia. 	<ul style="list-style-type: none"> • The water management system will treat the water before release. The effect is unlikely to occur. 	
	<ul style="list-style-type: none"> • Chemical weed control 	<ul style="list-style-type: none"> • Contamination by chemicals used during weed control 	<ul style="list-style-type: none"> • Preserve a 1-m buffer zone on each side of the railway right-of-way during chemical weeding activities. 	<ul style="list-style-type: none"> • If the standards are met, there should not be a residual effect. 	
Air quality	<ul style="list-style-type: none"> • Transport and movement • Blasting, excavation and earthwork • Borrow pits • Extraction – pit • Plant and concentrator • Tailings pond 	<ul style="list-style-type: none"> • Emissions of particulate matter, metals and gaseous compounds 	<ul style="list-style-type: none"> • Use dust suppressants on any surface capable of generating dust. • Cover roads with ultra-low-silt materials. • Gradually restore tailings ponds. • Ensure trucks carrying materials to the work site are fitted with a tarp. • Temporarily cease operations if weather conditions cause an unacceptable increase in the risk of release. 	<ul style="list-style-type: none"> • A few exceedances of the release standards relatively close to the project infrastructure and in locations where no human activity has been inventoried are anticipated. 	
	<ul style="list-style-type: none"> • Transport and movement • Blasting, excavation and earthwork • Extraction – pit • Plant and concentrator 	<ul style="list-style-type: none"> • GHG emissions 	<ul style="list-style-type: none"> • Avoid letting vehicle engines idle. • Use the low-idle feature for locomotives. 	<ul style="list-style-type: none"> • GHG emissions are estimated at 12 mt CO₂ eq, the vast majority of which is related to rail transport. 	

	Degree of Severity of Adverse Residual Effect				Significance of Residual Effect	Need for Monitoring
	Magnitude	Extent	Duration	Occurrence		
	Moderate	Local	Long	High	Moderate	<ul style="list-style-type: none"> • Monitoring is required in order to meet the provisions of the MMER. Monitoring is also required in order to verify the effectiveness of the mitigation measures. • Monitoring of the quality of treated effluent, surface water and groundwater. • Periodic monitoring of water levels in Lake A-2.
	Low	Local	Short	Low	Very low	
	Low	Local	Short	Low	Very low	
	Low	Isolated	Long	High	Low	
	Low	Regional	Long	High	Moderate	

Summary of the environmental effects of the project continued

Valued Component	Activities	Potential Effects	Summary of Mitigation Measures (See Appendix 2 for Details)	Residual Effects
Fish and fish habitat	<ul style="list-style-type: none"> • Tree clearing • Excavation and earthwork 	<ul style="list-style-type: none"> • Sediment input to habitat • Disturbance of spawning by fine particle deposition 	<ul style="list-style-type: none"> • Do not carry out operations in the water during the restriction period (April 15 to June 15). • Implement an erosion- and sediment-control plan in each phase of the project. 	<ul style="list-style-type: none"> • The mitigation measures will prevent or significantly reduce sediment input and effects on fish.
	<ul style="list-style-type: none"> • Tailings disposal • Water management • Extraction – pit dewatering 	<ul style="list-style-type: none"> • Permanent loss of fish habitat through encroachment and dewatering, as well as through modification of water inflow 	<ul style="list-style-type: none"> • Implement a fish habitat compensation plan. 	<ul style="list-style-type: none"> • Fish habitat losses of 250,000 m². The losses will be compensated.
	<ul style="list-style-type: none"> • Diking and water management • Blasting • Stream crossing 	<ul style="list-style-type: none"> • Fish mortality 	<ul style="list-style-type: none"> • Implement a fish habitat compensation plan. • Do not carry out operations in the water during the restriction period (April 15 to June 15). • Comply with the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998). • Take measures to limit fish mortality during the diking work required for the creation of the retention ponds. 	<ul style="list-style-type: none"> • Mortality of fish in all water bodies that will be destroyed through dewatering or encroachment is inevitable. However, the compensation plan will mitigate those effects. • Blasting operations for the construction of the railway could cause fish mortality, particularly near the outlet of Lake Jules.

	Degree of Severity of Adverse Residual Effect				Significance of Residual Effect	Need for Monitoring
	Magnitude	Extent	Duration	Occurrence		
	Low	Isolated	Short	Moderate	Very low	<ul style="list-style-type: none"> Monitoring is required in order to meet requirements related to the issuance of authorizations under the <i>Fisheries Act</i>.
	Moderate	Local	Long	High	Moderate	
	Moderate	Isolated	Long	High	Moderate	

Summary of the environmental effects of the project continued

Valued Component	Activities	Potential Effects	Summary of Mitigation Measures (See Appendix 2 for Details)	Residual Effects
Birds and bird habitat	<ul style="list-style-type: none"> • Tree clearing • Excavation and earthwork • Site preparation 	<ul style="list-style-type: none"> • Habitat loss 	<ul style="list-style-type: none"> • Implement a wetland compensation plan. • Make the use of developed areas a priority and use wetlands only as a last resort. • Dispose of materials or debris from tree clearing operations at least 60 m away from the shores of a lake, stream, floodplain, marsh, swamp or peat bog. • Restore streams and streambanks disturbed by culvert and bridge installation work. • Do not cut down trees unnecessarily, and protect trees on the borders of the areas to be developed. • Preserve the vegetation bordering lakes, streams and access roads. • Preserve shrubs, stumps and the root system of felled trees on the shores of streams and lakes, on steep slopes and in wetlands. 	<ul style="list-style-type: none"> • The loss of approximately 1,200 ha of terrestrial and aquatic habitat will affect several hundred breeding pairs. • Four birds species will be affected: approximately 40 pairs of olive-sided flycatchers, 3 to 17 pairs of rusty blackbirds, up to about 20 pairs of Canada warblers. • Given the abundance of similar habitat available in the project region, bird populations are likely to successfully become established elsewhere. Habitat losses will be partly reversible following the restoration of the mine site.
	<ul style="list-style-type: none"> • Use of equipment, transport and movement 	<ul style="list-style-type: none"> • Disturbance of birds by disturbance of the acoustic environment 	<ul style="list-style-type: none"> • Avoid using equipment that generates impulse noise. • Minimize the use of back-up alarms. • Include sound power as an additional selection criterion when procuring equipment. • Restrict machinery movement to the railway right-of-way. 	<ul style="list-style-type: none"> • The noise and comings and goings stemming from the construction, development and operation activities could disturb birds and cause behavioural changes that could affect feeding and breeding. • However, the mitigation measures should effectively mitigate the magnitude and extent of the effect.
	<ul style="list-style-type: none"> • Water and tailings management 	<ul style="list-style-type: none"> • Bird contamination and/or mortality by wastewater from treatment ponds 	<ul style="list-style-type: none"> • Comply with subsection 5.1 of the <i>Migratory Birds Convention Act, 1994</i> (MBCA), which prohibits the deposit of 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. 	<ul style="list-style-type: none"> • The effect is of very low significance and is unlikely to occur, since the toxicity level of the pond water is expected to be low and the birds are unlikely to ingest it.

	Degree of Severity of Adverse Residual Effect				Significance of Residual Effect	Need for Monitoring
	Magnitude	Extent	Duration	Occurrence		
	Low	Local	Long	High	Low	<ul style="list-style-type: none"> Monitoring is required because the project is likely to have a residual effect on four bird species at risk.
	Low	Isolated	Long	High	Low	
	Low	Isolated	Long	Low	Very low	

Summary of the environmental effects of the project continued

Valued Component	Activities	Potential Effects	Summary of Mitigation Measures (See Appendix 2 for Details)	Residual Effects
Birds and bird habitat	<ul style="list-style-type: none"> • Tree clearing and site preparation 	<ul style="list-style-type: none"> • Disturbance of bird breeding / mortality of embryos caused by destruction of birds' nests 	<ul style="list-style-type: none"> • Establish a buffer zone around nests, particularly nests of migratory birds, during the breeding season. • Restore disturbed streambanks. • Carry out felling, grubbing and overburden removal operations only outside the period of April 21 to August 15. 	<ul style="list-style-type: none"> • Low risk, given the mitigation measures. Despite the application of the mitigation measures, a few birds' nests could be destroyed.
Terrestrial wildlife and their habitat	<ul style="list-style-type: none"> • Tree clearing and site preparation 	<ul style="list-style-type: none"> • Habitat loss 	<ul style="list-style-type: none"> • Inventory winter moose habitat. If winter habitat is disturbed, carry out compensatory work. • Revegetate the right-of way with native species after the construction work. • Limit tree clearing and protect wooded areas adjacent to the work sites. • Locate construction site trailers and machinery storage areas at the temporary workers' camp. 	<ul style="list-style-type: none"> • Loss of 1,200 ha, or less than 2% of the local study area and trapline. A portion will be restored.
	<ul style="list-style-type: none"> • Transport and movement 	<ul style="list-style-type: none"> • Terrestrial wildlife mortality 	<ul style="list-style-type: none"> • Restrict machinery movement to established paths within the construction area and keep to existing forest paths. 	<ul style="list-style-type: none"> • For certain species, rail and road movement and transport could lead to mortality due to collisions.
	<ul style="list-style-type: none"> • Machinery use, transport and movement • Construction of railway line 	<ul style="list-style-type: none"> • Disturbance of terrestrial wildlife by disturbance of the acoustic environment 	<ul style="list-style-type: none"> • See the noise mitigation measures for the valued component of birds and bird habitat. 	<ul style="list-style-type: none"> • The noise generated could disturb terrestrial wildlife. The feeding, breeding and rearing behaviours of certain species could be affected. • The mitigation measures will be effective for reducing the magnitude, extent, duration and probability of occurrence of the effect.

	Degree of Severity of Adverse Residual Effect				Significance of Residual Effect	Need for Monitoring
	Magnitude	Extent	Duration	Occurrence		
	Low	Isolated	Short	Moderate	Very low	<ul style="list-style-type: none"> Monitoring is required because the project is likely to have a residual effect on four bird species at risk.
	Moderate	Local	Long	High	Moderate	<ul style="list-style-type: none"> No monitoring required.
	Low	Isolated	Long	High	Low	
	Low	Isolated	Long	High	Low	

Summary of the environmental effects of the project continued

Valued Component	Activities	Potential Effects	Summary of Mitigation Measures (See Appendix 2 for Details)	Residual Effects	
Current use of lands and resources for traditional purposes	• Tree clearing and site preparation	• Loss of use of land (hunting, fishing, gathering)	• Restoration of the mine site and habitat.	• Loss of the use of approximately 1,200 ha of the land, or slightly more than 1% of trapline O-59.	
	• Tree clearing and site preparation • Construction of mine infrastructure	• Loss of a hunting camp	• Move the Wapachee family's camp to a sector not affected by traffic.	• The relocation of the Rabbit camp (trapline O-59) will compensate for this project effect.	
	• Excavation and earthwork • Roads and railway line	• Risk to user safety	• Notify the tallyman of the work period. • Install signage at high-risk sites on the access road.	• The risk of accidents will be low.	
	• Machinery use, transport and movement • Construction of railway line	• Disturbance of land users	• Notify the tallyman of the work period. • Regularly maintain any equipment that emits noise at nuisance levels. • Ensure that equipment mufflers are always in good working order.	• The noise could disturb individuals using the land for traditional purposes and could drive away animals hunted and trapped in the local study area. • However, the mitigation measures will effectively reduce the magnitude, extent, duration and probability of occurrence of the effect.	
	• Transport and movement • Blasting, excavation and earthwork • Borrow pits • Extraction – pit • Plant and concentrator • Tailings pond	• Risk of contamination of traditional food	• Also see the measures that will be applied for air quality and water resources and that should enable compliance with the standards.	• No residual effects because the effect is unlikely to occur, given the proponent's obligation to meet air and water quality standards.	

	Degree of Severity of Adverse Residual Effect				Significance of Residual Effect	Need for Monitoring
	Magnitude	Extent	Duration	Occurrence		
	Moderate	Local	Long	High	Moderate	<ul style="list-style-type: none"> Monitoring is required because of the concerns raised by Aboriginal groups regarding contamination of traditional food and uncertainties related to the predicted effects of the project on current use of the lands and resources for traditional purposes.
	Moderate	Isolated	Long	High	Moderate	
	Low	Isolated	Long	Low	Very low	
	Low	Local	Long	High	Low	
	Low	Isolated	Short	Low	Very low	

Appendix 6

Excerpts from directive 019 and from the metal mining effluent regulations (MMER)

Directive 019

Directive 019 on the mining industry is the tool currently used to analyze mining projects that require a certificate of authorization to be issued under Quebec's *Environment Quality Act*. It includes provisions designed to protect surface and groundwater.

Directive 019 states that final effluent may not be discharged if:

- the pH is lower than 6.0 or greater than 9.5;
- the concentration of thiosalts causes a change in the pH of the aquatic environment lower than 6.0 or greater than 9.5;
- the toxicity exceeds the acute lethality level according to tests on rainbow trout (*Oncorhynchus mykiss*) and daphnia (*Daphnia magna*); or
- the contaminant concentration exceeds the values indicated in the table below.

The operator must install a groundwater monitoring network around at-risk facilities, as defined in section 2.3.1.1, except where there are Class III underlying hydrogeological formations with no hydraulic connection. The parameters to be analyzed are those listed in the table above (except for suspended solids), as well as the major ions (Ca^{2+} , HCO_3^- , K^+ , Mg^{2+} , Na^+ , SO_4^{2-}), pH and electrical conductivity. In groundwater, however, dissolved metals (rather than extractable metals) must be measured. depending on the nature of the ore, process or tailings, other parameters may be added to the groundwater quality monitoring, under section 20 of Quebec's *Environment Quality Act*.

Requirements at the final effluent discharge point⁹

Parameter	Column 1 Acceptable monthly mean concentration	Column 2 Maximum acceptable concentration
Extractable arsenic	0.2 mg/l	0.4 mg/l
Extractable copper	0.3 mg/l	0.6 mg/l
Extractable iron	3 mg/l	6 mg/l
Extractable nickel	0.5 mg/l	1 mg/l
Extractable lead	0.2 mg/l	0.4mg/l
Extractable zinc	0.5 mg/l	1 mg/l
Extractable cyanides	1 mg/l	2 mg/l
Extractable hydrocarbons	-----	2 mg/l
Suspended solids	15 mg/l	30 mg/l

⁹ Depending on the nature of the ore, process or tailings, or the calculation of the environmental objectives for discharge (see section 1.4.2), additional requirements may apply at the final effluent discharge point under section 20 of the Act when the certificate of authorization is issued. http://www.mddep.gouv.qc.ca/milieu_ind/directive019/

Metal Mining Effluent Regulations (MMER)

The MMER applies to all Canadian metal mines (except placer mines) that exceed an effluent flow rate of 50 cubic metres per day and deposit effluent into fisheries waters at any time after the regulations were registered. The MMER prescribes 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).

Authorized limits of deleterious substances

Table taken from Schedule 4 to the MMER

Deleterious Substance	Maximum Authorized Monthly Mean Concentration	Maximum Authorized Concentration in a Composite Sample	Maximum Authorized Concentration in a Grab Sample
Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
Cyanide	1.00 mg/L	1.50 mg/L	2.00 mg/L
Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
Total suspended solids	15.00 mg/L	22.50 mg/L	30.00 mg/L
Radium-226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L

Note: All concentrations are total values.

Mines subject to the MMER are also required to conduct Environmental Effects Monitoring (EEM) programs 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.

<http://laws-lois.justice.gc.ca/eng/regulations/SOR-2002-222/>

Appendix 7

Environmental Components Affected by the Project

Habitat Type		Mine Site	Rail Line
		Loss (ha)	Loss (ha)
Forest	Regenerating coniferous forest	579.12	18.35
	Closed mature coniferous forest	248.92	9.52
	Open mature coniferous forest	22.55	10.51
	Unproductive setting	37.90	0.06
	Mature mixed forest	37.25	0.19
	Regenerating mixed forest	31.20	5.95
	Deciduous forest	8.51	0.19
	Plantation	0.77	2.12
	Islands	0	0
	TOTAL	966.23	46.89
Wetlands	Marsh	1.88	0
	Shrub swamp	27.93	0.72
	Treed swamp	3.92	0
	Disturbed treed swamp	11.74	0
	Treed peatland	107.27	11.44
	Disturbed treed peatland	0	2.03
	Fen	0	0.61
	Bog	51.38	1.65
	TOTAL	204.12	16.44
Drainage network		29.4	0.03

- 1 The access road is built and in good repair over 90% of its length. The Lake France section to be built is 3.5 km long with a 10 m wide rolling surface.
- 2 The surface area of the pit is the length of the deposit to be mined by 2028 (Phase 1 pit), or 2.8 km, times an estimated average width of 400 m.
- 3 The area of the plant and crusher includes the area covered by the conveyor, concentrator, ore stockpile, electrical substation, being areas on the east, south and southeast sides of Lake Denis, as well as the workspace around the facilities.
- 4 The area of the garage includes the rolling surface around the garage.
- 5 The area of the fine tailings pond includes the polishing pond.
- 6 The mining roads run from the pit to the crusher, tailings management facilities or garage; they are approximately 6 km long and up to 30 m wide.

Appendix 8

Water Bodies and Streams to be Added to Schedule 2 to the MMER

Primary water body components destroyed by the construction of the waste rock dump

Identification	Area (m ²)	Fish species present	Water body functions
Lake B-11	2,686	Northern pearl dace, northern redbelly dace	Feeding, spawning and nursery for cyprinids Depth: <0.2 m
Lake B-12	6,870	Northern pearl dace, northern redbelly dace, brook trout	Feeding, nursery for brook trout and cyprinids, spawning for cyprinids Depth: <0.3 m
Lake B-13	12,104	Northern pearl dace, northern redbelly dace	Feeding, spawning and nursery for cyprinids Depth: <0.9 m
Lake B-14	34,625	Northern pearl dace, northern redbelly dace, brook trout	Feeding, nursery for brook trout and cyprinid, spawning for cyprinid Depth: <0.8 m
Pond P-2.b1	1,327	Northern pearl dace, northern redbelly dace, brook trout	Feeding, spawning and nursery for cyprinids, feeding for brook trout Depth: <0.4 m
Pond P-2.b2	571	Northern pearl dace, northern redbelly dace, brook trout	Feeding, spawning and nursery for cyprinids, feeding for brook trout Depth: <0.4 m
TOTAL	58,183	Three species	

Primary stream components destroyed by the construction of the waste rock dump

Identification	Length (m)	Area (m ²)	Fish species present	Stream functions
Outlet of lake B 13 (streams P 4.1 1, P-4, P-3.1)	1,718	2,577	Northern pearl dace, northern redbelly dace	Feeding, spawning, nursery for brook trout, cyprinids
Outlet of lake B 12 (stream F-3)	155	194	Northern pearl dace, northern redbelly dace, brook trout	Feeding, spawning, nursery for brook trout, cyprinids
Outlet of lake B 11 (stream P-3.2)	26	13	Pearl dace, northern redbelly dace	Feeding, spawning, nursery for cyprinids
Mountain outlet, upstream section (stream F-2)	977	1,466	Northern pearl dace, northern redbelly dace, brook trout	Feeding, spawning, nursery for brook trout, cyprinids
Outlet of lake B 14 (stream P-1)	674	1,011	Northern pearl dace, northern redbelly dace, brook trout	Feeding, spawning, nursery for brook trout, cyprinids
NE tributary of lake B-14 (stream P-2.1)	107	107	Northern pearl dace, northern redbelly dace, brook trout	Feeding for brook trout, cyprinids
NE tributary of lake B-14 (stream P-2.2-1)	88	88	Northern pearl dace, northern redbelly dace, brook trout	Feeding for brook trout, cyprinids
NE tributary of lake B-14 (stream P-2.3-1)	29	29	Northern pearl dace, northern redbelly dace, brook trout	Feeding for brook trout, cyprinids
NE tributary of lake B-14 (stream P-2.4-1)	10	10	Northern pearl dace, northern redbelly dace, brook trout	Feeding for brook trout, cyprinids
TOTAL	3,784	5,495	Three species	

Primary water body components destroyed by the construction of the tailings pond

Identification	Area (m ²)	Fish species present	Water body functions
Lake B-3	13,076	Northern pike, white sucker, northern pearl dace, northern redbelly dace or finescale dace	Spawning, nursery, feeding for northern pike, nursery, feeding for white sucker Depth: <0.5 m
Lake B-6	7,051	Northern pike, white sucker, northern pearl dace, northern redbelly dace or finescale dace	Spawning, nursery for northern pike and cyprinids, feeding for cyprinids Depth: <0.2 m
Lake B-7	3,105	Northern pike, white sucker, northern pearl dace, northern redbelly dace or finescale dace	Spawning, nursery, feeding for northern pike, nursery, feeding for white sucker Depth: <1.0 m
TOTAL	23,232	Five species	

Primary stream components destroyed by the construction of the fine tailings pond

Identification	Length (m)	Area (m ²)	Fish species present	Stream functions
Outlet of lake B 3 (stream D1+D 2)	1,146	11,468	Northern pike, white sucker, northern pearl dace, northern redbelly dace or finescale dace	Spawning, nursery, feeding, winter refuge habitat for northern pike and white sucker
Outlet of lake B 6 (stream D 4)	1,384	11,072	Northern pike, white sucker, northern pearl dace, northern redbelly dace or finescale dace	Spawning, nursery, feeding, winter refuge habitat for northern pike and white sucker
Outlet of lake B 7 (stream D 5.1)	223	1,561	Northern pike, white sucker, northern pearl dace, northern redbelly dace or finescale dace	Spawning, nursery, winter refuge habitat for northern pike and white sucker
Mountain outlet, downstream section (stream F-1)	731	2,193	Brook trout, northern pearl dace, northern redbelly dace, white sucker	Spawning, nursery, feeding for brook trout, white sucker and cyprinids
TOTAL	3,484	26,294	Six species	

Primary water body components destroyed by the construction of the coarse tailings pond

Identification	Area (m ²)	Fish species present	Water body functions
Lake B-1	3,034	Northern pearl dace, northern redbelly dace, brook stickleback	Spawning, nursery, feeding for cyprinids Depth: <0.5 m
TOTAL	3,034	Three species	

Primary stream components destroyed by the construction of the coarse tailings pond

Identification	Length (m)	Area (m ²)	Fish species present	Stream functions
Outlet of lake B 1	200	200	Northern pearl dace, northern redbelly dace, brook stickleback	Spawning, nursery, feeding for cyprinids
Outlet of Lake Denis (stream D 6.1)	160	608	Northern pike, white sucker, northern pearl dace, northern redbelly dace	Spawning, nursery, feeding, winter refuge habitat for northern pike, white sucker
TOTAL	360	808	Five species	

Total area of water bodies and streams to be added to Schedule 2 to the MMR

Infrastructure	Water Body (m ²)	Stream (m ²)	Total (m ²)
Waste rock dump	58,183	5,495	63,678
Fine tailings pond	23,232	26,294	49,526
Coarse tailings pond	3,034	808	3,842
Total	84,449	35,597	117,046

Appendix 9

Concerns Raised by Aboriginal Groups

The summary below summarizes the concerns raised by Aboriginal groups through consultations held in support of the environmental assessment of the BlackRock Mining Project.

List of abbreviations

CNM	Cree Nation of Mistissini
O-BCN	Oujé-Bougoumou Cree Nation
PT	Pekuakamiulnuatsh Takuhikan

Résumé des préoccupations soulevées par les groupes autochtones

#	Group	Topic	Comment or concern
1	PT	Transport	<ul style="list-style-type: none"> Ore transport by the existing railway line has not been assessed. The rail line runs through the community and the territory claimed by PT, which will increase the risk of accidents and malfunctions. Issues regarding water quality, plants and animals, use of the land, potential rights and human rights were raised.
2	CNM, PT	Land use	<ul style="list-style-type: none"> The proponent did not fully document land use in its study area. Data on the practices of members of the CNM and PT were omitted.
3	CNM, PT	Land use	<ul style="list-style-type: none"> The project will cause the area to be opened up. The presence of the mine will facilitate access, resource consumption and poaching.

	Summary of proponent's response	Agency's response
	<ul style="list-style-type: none"> • According to the proponent, the addition of a bi-directional train will increase traffic on the existing railway. Nuisances to the human environment (noise, vibrations and other) will be significant, given the crossing through inhabited areas. However, this segment was used far more extensively in the past. The environmental and social impact of the use of this segment is considered low. 	<ul style="list-style-type: none"> • The Agency consulted the Canadian Transportation Agency, which also believes that one train per day should not have a major impact on the community.
	<ul style="list-style-type: none"> • Since September 5, 2013, a number of traplines have been formally transferred to the community of Oujé-Bougoumou, including M/O-57. Only O-59 remains. The use of this trapline has been documented. Furthermore, meetings have been held with other users of the territory of the community of Mistissini, including the Metabie and Shecapio families, to discuss their use of the area. • Updated information from 2011 confirmed that trapline 24 has not been used by members of the PT community for traditional activities for several years. No site of interest has been inventoried to date in that area. No specific land allocations (heritage sites, Innu parks, fully owned lands) were identified in the study area during land negotiations. 	<ul style="list-style-type: none"> • The Agency is satisfied with the efforts made by the proponent to document land use in the study area. The project and its potential environmental impact are concentrated in trapline O-59, and the proponent has focused its efforts on documenting land use in that area. The Agency asked the proponent to document land use in trapline M/O-57, which has been done. • The proponent has consulted the members of the Mistissini community on multiple occasions. One family that uses trapline M/O-57, however, is still dissatisfied with the way it was consulted by the proponent. • Note that the proponent will be setting up a follow-up committee. The Agency recommends that the proponent involve representatives of the Mistissini and Pekuakamiulnuatsh Takuhikan communities.
	<ul style="list-style-type: none"> • BlackRock Metals cannot usurp the role of the relevant authorities in managing hunting and fishing activities that may take place close to its operations in the area in question. However, BlackRock Metals is planning a number of measures to make access to the resource more difficult. For example, firearms will not be allowed on the mine site, and workers will be transported by bus and will not stay at the mine site outside working hours. 	<ul style="list-style-type: none"> • The mitigation measures planned by the proponent should limit abusive consumption of the resources.

#	Group	Topic	Comment or concern
4	PT	Land use	<ul style="list-style-type: none"> The project will have an influence on the future possibility of using the area.
5	CNM, O BCN	Land use	<ul style="list-style-type: none"> Contamination of the water, fish and animals will prevent land users from practising their way of life.
6	PT	Quality of the analysis	<ul style="list-style-type: none"> The ecological characterization of the terrestrial environment is flawed. It is fragmented (climate, geology, geomorphology), with no mapping and with minimal analysis of the landscapes.
7	CNM	Quality of the analysis	<ul style="list-style-type: none"> Information missing regarding the effect of water level fluctuations caused by the project on the adjacent aquatic system.
8	CNM	Quality of the analysis	<ul style="list-style-type: none"> Information missing on the proponent's ability to control spills into the hydrological system or the quality of the final effluent.
9	PT	Quality of the analysis	<ul style="list-style-type: none"> Doubts about field surveys carried out by the proponent to determine the presence of threatened species in the project study area.

	Summary of proponent's response	Agency's response
	<ul style="list-style-type: none"> Although no mining activity on Innu land is planned, a noticeable impact could be felt there unless appropriate integration measures are put in place, particularly with respect to noise, particulate matter and airborne contaminants. Mitigation measures have been determined with regard to air quality, since it is the only significant element that could have a long-term impact on the environment south of the project. Furthermore, all of the water in contact with the project is located in and drains to the James Bay watershed. The residual effects are considered to be low with regard to Innu land ("Nitassinan"). 	<ul style="list-style-type: none"> After analyzing the file, the Agency has concluded that the potential environmental effects of the project on the use of Innu land ("Nitassinan"), particularly effects caused by the waste rock dump, which extends into the territory, are low for the Pekuakamiulnuatsh Takuhikan community. The Agency also notes that the entire project falls within the area covered by the James Bay and Northern Quebec Agreement (JBNQA).
	<ul style="list-style-type: none"> BlackRock Metals is committed to rigorously adhering to regulations. Water management at the site and along the railway was to be central to its concerns and monitoring efforts. Precautions and monitoring of water management and protection will prevent adjacent aquatic environments containing fish from being contaminated. 	<ul style="list-style-type: none"> The Agency acknowledges that the entire area between the Canadian National railway and the mine site will be under the influence of the intensive mining activity and that this will reduce or eliminate other land use possibilities. The proponent will have to inform community members of sites they should avoid. Considering the mitigation and compensation measures proposed by the proponent, the Agency believes that the project will not have significant adverse effects on use of the land for traditional purposes.
		<ul style="list-style-type: none"> After receiving and performing a preliminary analysis of the environmental impact statement, the Agency requested supplemental information from the proponent on many issues related to the ecological characterization of the terrestrial environment. The Agency is satisfied with the clarification it received from the proponent. All of the supplemental information has been forwarded to the PT community.
		<ul style="list-style-type: none"> The Agency took this concern into account in its analysis of the impact of the project on water resources. The Agency is satisfied with the proponent's answers to questions on this matter. The Agency believes that the project will not have significant adverse effects on water resources, in light of the mitigation measures that will be implemented by the proponent.
	<ul style="list-style-type: none"> The proponent has made a commitment to apply a water management plan and a number of mitigation measures in order to minimize the impact on the environment. 	<ul style="list-style-type: none"> The Agency believes that the project will not have significant adverse effects on surface water, in light of the mitigation measures that will be implemented by the proponent. Those measures are detailed in section 7.2 of this report, as well as in Appendix 2. Furthermore, monitoring will be performed. The proponent will be subject to federal (MMER) and provincial (Directive 019) regulation.
	<ul style="list-style-type: none"> The proponent consulted appropriate databases and carried out new animal and plant surveys to supplement the basic information. 	<ul style="list-style-type: none"> The Agency is satisfied with the surveys that were carried out.

#	Group	Topic	Comment or concern
10	PT	Quality of the analysis	<ul style="list-style-type: none"> The proponent does not clearly acknowledge that one of its components (waste rock dump) crosses the boundaries of the traditional Innu territory. The community considers this crossing to be a fact.
11	CNM	Quality of the analysis	<ul style="list-style-type: none"> Opinion that the weather is becoming increasingly extreme. Fear that the proponent has not factored that possibility into its contaminated water management plan.
12	CNM	Closure and remediation	<ul style="list-style-type: none"> Doubt about the possibility of restoring Lake Denis after the mine closes.
13	PT	Cumulative impact	<ul style="list-style-type: none"> The study of the cumulative impact on the territory is incomplete. The analysis is limited to the local context and fails to take into account the cumulative impact of activities on a regional scale.
14	CNM, O BCN	Cumulative impact	<ul style="list-style-type: none"> The cumulative impact assessment should include all existing information on the possible Phase 2 of the BlackRock Mining Project.
15	CNM, O BCN	Contaminants	<ul style="list-style-type: none"> Desire to access all information on the nature and use of chemicals at the mine site.

	Summary of proponent's response	Agency's response
	<ul style="list-style-type: none"> Given the lack of precision on the maps provided in the Agreement-in-Principle of General Nature (APGN), BlackRock Metals refers responsibility for the matter back to the government agencies that have the authority to shed light on the issue. The impact on the area is documented in the numerous documents provided by BlackRock Metals to the Agency. 	<ul style="list-style-type: none"> The Agency has consulted Aboriginal Affairs and Northern Development Canada (AANDC) to determine the location of the waste rock dump. Following consultation of the various maps available, the waste rock dump appears to extend into the APGN territory. However, it is limited to the JBNQA territory.
	<ul style="list-style-type: none"> The proponent has factored the influence of weather conditions into the design of its project. For example, it has taken extreme rainfall and extreme weather into account in the planning and management of the tailings pond, for example by providing for a treatment plant of adequate capacity. 	<ul style="list-style-type: none"> The Agency asked the proponent to provide an emergency plan that covers extreme situations. The proponent has provided a broad outline of its emergency plan, and extreme situations are taken into account. The plan will evolve as activities are carried out at the site, and the proponent has made a commitment to update it annually. The Agency is satisfied with the information provided by the proponent.
	<ul style="list-style-type: none"> Lake Denis will be lost because it will be cut off from influent flows upstream as well as downstream waters. Lake Denis is therefore considered fish habitat loss that will have to be offset. 	<ul style="list-style-type: none"> Fisheries and Oceans Canada considers Lake Denis a loss that must be offset. Its restoration after the mine closure is uncertain.
		<ul style="list-style-type: none"> The only effect that the project is expected to have on Innu land ("Nitassinan") is related to air quality. The analysis of the cumulative effects focuses on valued components that represent regional issues. The Agency believes it is reasonable that the proponent has not carried out a detailed analysis of cumulative effects related to air quality, since it is not a valued component that could be affected by a cumulative effect.
	<ul style="list-style-type: none"> The cumulative effects described took into consideration the operation of the Armitage site, even though they were not quantified, since BlackRock Metals' current development efforts are concentrated in the southwest area and potential operation further south is still an option being explored, the actual feasibility of which will have to be determined by more in-depth analysis. 	<ul style="list-style-type: none"> The Agency is satisfied with the proponent's response. The analysis of the cumulative effects must take into account future projects that are certain and reasonably foreseeable, as defined in the Agency's 2007 operational policy statement on cumulative effects. Phase 2 of the BlackRock project is, at this time, a hypothetical project. However, the proponent will have to agree to fully inform communities of the progress of studies of Phase 2 of the project.
		<ul style="list-style-type: none"> In its impact statement, the proponent provided information on the chemicals that will be used at the mine site, including those used for process water treatment and chemical weed control. Furthermore, note that the conditions set out in the COMEX certificate of authorization require the proponent to provide COMEX with details, within six months of the authorization of the project, of the chemicals used in the blowdown water cooling and neutralization system, in the iron ore production process, and in the final effluent treatment unit. The communities will be invited to contact COMEX to obtain those details.

#	Group	Topic	Comment or concern
16	CNM	Contaminants	<ul style="list-style-type: none"> • Concern regarding the possibility that dust from the mine may affect a vast area.
17	CNM	Consultations by the proponent	<ul style="list-style-type: none"> • The proponent's method of transmitting information prevented the Mistissini band council and community from fully participating in the consultation process and properly understanding the extent and scope of the environmental effects. • The proponent did not transmit key elements of its impact statement in a timely manner during the consultation process (geochemical study, railway, hydrological study, air emissions model). Very little time was allotted for review. • A number of documents were produced only in French by the proponent. Few Crees read or speak French fluently.
18	CNM	Fish habitat	<ul style="list-style-type: none"> • Opinion that the fish habitat compensation program is insufficient for offsetting all losses.
19	PT, CNM	Air quality	<ul style="list-style-type: none"> • Concerns about contaminant dispersal in the atmosphere. An air quality monitoring program is believed to be necessary.

	Summary of proponent's response	Agency's response
	<ul style="list-style-type: none"> The proponent has assessed the airborne particulate dispersal. Exceedances of the criteria are low, as is their occurrence. 	<ul style="list-style-type: none"> Given the application of the proposed mitigation measures and the air quality and air emissions monitoring that will be carried out by the proponent, the Agency concludes that the project is unlikely to have significant adverse environmental effects on air quality. The federal committee requested that an air quality monitoring program be implemented. The proponent made a commitment to implement such a program and adjust the mitigation measures in the event that the project has a real impact on air quality.
		<ul style="list-style-type: none"> The key documents in the environmental assessment, such as the mine and railway impact assessment and a number of other complementary documents, were translated. A Cree-language summary of the impact statement was produced by the proponent to foster consultation. The Agency transmitted, on a regular basis and as quickly as possible, all of the information provided by the proponent. The Agency ensured that documents supporting public participation and Aboriginal consultation were translated. The comprehensive study report was published in both official languages.
		<ul style="list-style-type: none"> Fisheries and Oceans Canada will prepare a compensation plan that will offset the losses caused by the project. The community will be invited to participate in it.
	<ul style="list-style-type: none"> The proponent agrees to set up an air quality sampling and measurement station, as well as a meteorological station to monitor particulate releases and meteorological parameters, such as temperature and air humidity. Corrective measures may be taken, depending on the monitoring results. 	<ul style="list-style-type: none"> In light of the proposed mitigation measures and the air quality and air emissions monitoring that will be implemented by the proponent, the Agency concludes that the project is not likely to have significant adverse environmental effects on air quality. The federal committee asked that an air quality monitoring program be implemented. The proponent agreed to implement such a program and to adjust the mitigation measures in the event that the project has a real impact on air quality.

#	Group	Topic	Comment or concern
20	PT	Water quality	<ul style="list-style-type: none"> Lack of information on environmental risks related to the use of Lake Denis as a tailings pond.
21	CNM	Culture	<ul style="list-style-type: none"> The assessment of certain ecological components (such as the nearby lakes and streams) failed to take into account Aboriginal people's perspective on their cultural importance.
22	O BCN	Health	<ul style="list-style-type: none"> Concern that the mine will cause major health problems for people who eat traditional food.

	Summary of proponent's response	Agency's response
	<ul style="list-style-type: none"> It was ultimately decided that Lake Denis would not be used as a tailings pond. 	<ul style="list-style-type: none"> Even though Lake Denis will not be used as a tailings pond, it will be lost because it will lose all of its hydrological connections. Fisheries and Oceans Canada has added Lake Denis to the habitat losses to be offset.
		<ul style="list-style-type: none"> The proponent and the Agency have assessed all repercussions of the environmental changes that the project could have on current use of lands and resources for traditional purposes and on any thing of historical, archaeological, paleontological or architectural significance (see Chapter 7.7 of the comprehensive study report).
	<ul style="list-style-type: none"> Health Canada asked the proponent about the risks of contamination of traditional food by atmospheric deposition. The proponent assessed the atmospheric dispersal of particulate compounds. Exceedances of the criteria are low, as is their occurrence. The area where dust has an impact is not used much by the Cree community. BlackRock Metals Inc. has made a commitment to meet the water quality standards in effect. Compliance with the standards for final effluent and water recirculation are factors that will be put in place to prevent contamination of the environment and thus of foods of animal or plant origin for land users. 	<ul style="list-style-type: none"> The Agency believes that the conditions set out by the Provincial Administrator in its certificate authorization, such as the requirement to monitor fish populations and fish consumption, the development of a strategy for communicating with Aboriginal communities, and the establishment of a monitoring committee, should make it possible to monitor the situation appropriately and minimize public health risks.

Appendix 10

Methodology for Assessment of Technological Risks and Potential Consequences

The proponent identified potential technological accidents associated with the project. It assessed the significance of technological risk using the methods listed in the tables below, which are taken from the impact statement summary. Note that this assessment is limited to the environmental impact of accidents and malfunctions.

Methodology for assessment of technological risk and potential consequences

Criteria	Scope	Reversibility	Importance for the Public	Probability of Occurrence
Definition	Extent of the physical area affected.	Speed at which the biophysical environment can recover with or without human assistance.	Local and regional public perception of the incident.	Assessment of event frequency.
Weighting	30%	10%	30%	30%
Significance of Potential Impact by Criteria				
1	Isolated	Effects from the incident can be rectified within a month.	Event that can easily be managed by local resources.	Highly unlikely.
2	Local	Can be restored within a year.	Event that will require the intervention of outside specialists.	Likely to occur once during the life of the mine and processing plant.
3	Regional	Will take more than one year to restore.	Event that should result in site closure.	Likely to occur more than once during the mine life.
Significance of Potential Impact				
Low	Weighted total between 0 and 1.5			
Moderate	Weighted total between 1.6 and 1.9			
High	Weighted total between 2.0 and 3			

Source: GENIVAR. BlackRock Project – Summary of the Environmental and Social Impact Assessment Statement, May 2013. Page 33.

Methodology for Assessment of Technological Risks and Potential Consequences continued

Criteria	Scope	Reversibility	Importance for the Public	Probability of Occurrence	Impact significance*	Potential Consequences
Weighting	0.3	0.1	0.3	0.3	1 to 3	
Petroleum products						
Oil spill during road construction	2	2	2	2	2.0	High
Spill during transport of petroleum products	2	2	2	2	2.0	High
Oil spill during the use of roads (transport trucks)	1	2	2	3	2.0	High
Major oil tank spill	2	2	2	1	1.7	Moderate
Leak from oil tanks and ancillary equipment	1	1	2	3	1.9	Moderate
Oil spill in garage or other workshop	1	1	1	3	1.6	Moderate
Oil spill in the pit, or on haulage roads or stockpiles	1	1	1	3	1.6	Moderate
Uncontrolled leachate during contaminated soil storage	1	1	2	2	1.6	Moderate
Reagents						
Spill during reagent transport	2	2	2	2	2.0	High
Spill at the plant during reagent handling	1	1	1	3	1.6	Moderate
Uncontrolled combustible dust emissions at the plant	1	1	2	3	1.9	Moderate
Fire or explosion inside the plant or reagent warehouse	1	2	2	2	1.7	Moderate
Reagent tank leak	1	2	2	2	1.7	Moderate

Source : GENIVAR. Projet minier de Métaux BlackRock – Résumé de l'étude d'impact sur l'environnement et le milieu social, Mai 2013. Pages 35-37.

Methodology for Assessment of Technological Risks and Potential Consequences continued

Criteria	Scope	Reversibility	Importance for the Public	Probability of Occurrence	Impact significance*	Potential Consequences
Weighting	0.3	0.1	0.3	0.3	1 to 3	
Hazardous Waste						
Hazardous waste storage site spill	1	1	1	3	1.6	Moderate
Hazardous waste storage site fire or explosion	1	1	2	2	1.6	Moderate
Explosives						
Unexploded or partially exploded explosives left in the pit	1	1	1	3	1.6	Moderate
Spill of raw materials used to manufacture explosives	1	1	1	3	1.6	Moderate
Geotechnical Stability						
Discharge of liquids due to dike failure	3	2	2	2	2.3	High
Discharge of solids due to dike failure	2	2	2	1	1.7	Moderate
Bench collapse: pit, waste rock or coarse tailings pile	1	2	2	1	1.4	High
Waste rock slide	1	1	2	2	1.6	Moderate
Other						
Major fire or explosion at the plant	2	3	3	1	2.1	High
Spill of secondary chemical products: workshop and garage	1	1	1	3	1.6	Moderate
Spill due to break in process water pipeline or ancillary equipment	1	1	1	3	1.6	Moderate
Process water reservoir leak	1	1	1	1	1	Low
Sewage spill	1	1		2	1.3	Low
Spill due to break in fine tailings pipeline	1	1	1	3	1.6	Moderate

Source: GENIVAR. BlackRock Project – Summary of the Environmental and Social Impact Assessment Statement, May 2013. Pages 34–35.

* Impact significance is the product of ‘score per criterion’ x ‘weighting factor’