BlackRock Project

Iron ore exploitation at lac Doré geological complex

Summary

April 2013

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1 INTRODUCTION

The purpose of the BlackRock Metals mining project is to produce iron ore concentrate from the complex geological Doré Lake, some 30 km south of Chibougamau. The deposit will be mined by open pit and the iron ore will be concentrated using primarily mechanical methods. A final flotation stage will also be required to produce a concentrate that can be used to make high-grade steel. Mine operation is scheduled to begin in 2013 and continue until 2028.

The project also includes the construction of a rail line between the mine site and the existing Canadian National (CN) railway network, as the iron concentrate will be transported by train from the plant to the Port of Saguenay, and then shipped by boat to one or more steel plants in Asia.

By land, the mine site lies some 60 kilometres from Chibougamau via Route 167 going south, and then logging road 210. The entire project lies on mineral claims held by BlackRock and in the territory governed by the James Bay and Northern Quebec Agreement (JBNQA).

The pit, processing plant, garages and warehouses, tailings management facilities, waste rock piles, overburden stockpile and construction camp will all lie within the Chibougamau town limits. Most of the project support infrastructure, including the access road, transmission line and rail line, will cross the Municipality of Baie-James and the town of Chibougamau. Hydro-Quebec is responsible for building the transmission line.

2 PROJ ECT BACKGROUND

2.1 Iron Ore Market

In Quebec, iron ore mining is making a comeback, and multiple development projects have been announced. In the case of BlackRock Metals, metallurgical testing shows that the Lac Doré deposit can yield a concentrate containing at least 62% iron and 1% vanadium. A substantial portion of the concentrate to be produced has been pre-sold.

The Lac Doré geological complex presents BlackRock Metals with an opportunity to mine a high-value-added iron ore deposit containing titanium and vanadium. The unique nature of the deposit will afford BlackRock Metals several years of market stability not otherwise available in Quebec. The economic and social impact is largely positive and will enhance the region's popularity and international influence.

A region that favours project development

The region's mining history eases the project's social acceptability. Chibougamau-area residents have a long mining tradition; mining was the economic driver and main source of jobs for the local and regional population for over half a century. After a number of years of decline, the regional mining industry will see a turnaround with the arrival of the BlackRock Metals project.

The project involves a total investment of in the order of $600 million (M). More than $400M will be spent on the construction of the processing plant and ancillary facilities, which covers 1.3 million man-hours that will mainly be worked by the region's residents. During mine operation, BlackRock Metals will directly employ some 160 workers. The project will also generate indirect employment that will stimulate general local and regional economic activity.

Integration of the project into the host environment

Land users and local authorities were involved in all phases of planning of the BlackRock Metals project, and decisions concerning project development were therefore made in light of their concerns.

The main issues for the project from a human perspective involve traditional activities and safe sharing of the road corridor from Route 167 to the mine site. Many integration measures are therefore planned for in this regard, along with other integration measures to compensate for effects on traditional land users.

With regard to the biophysical environment, fish habitat in the vicinity of the project is characterized by a very low representation of predatory species and an overabundance of species from the other levels of the food chain, which are more tolerant of marginal living conditions. This is indicative of the overall low quality of the fish habitat.

The hydrogeological study allowed the environment to be characterized and the best sites for tailings disposal to be identified. Analytical results for the tailings showed that they are neither acid generating nor leachable. In addition, the surface water collection system will isolate the mine site and protect the environment.

Compensation measures for fish habitat and wetlands will be implemented on trapline O-59 to increase productivity, with the assistance of the tallyman.

2.2 Project Assessment Process

Following the filing of the project notice and receipt of provincial and federal directives, BlackRock Metals filed its environmental impact assessment statement in late November 2011.

In March 2012, BlackRock Metals announced the addition of the rail line segment linking the CN track to the future mine site.

In May 2012, BlackRock Metals filed a feasibility study that increased production from 2.5 to 3.0 million tonnes (Mt) per year.

Also in 2012, BlackRock Metals reassessed the location of the facilities and decided to swap the tailings and waste rock dump sites. There were a number of reasons for this change: a smaller environmental footprint, significantly lower construction costs, increased occupational safety at the plant, sufficient water for plant start-up and allowance for expanded capacity given the high mineral potential in the area.

In addition, based on questions from the various levels of government, BlackRock Metals conducted supplementary geochemistry tests on the waste rock and tailings and additional bird and plant surveys in 2012. Additional surface water quality analyses were also performed to determine baseline conditions.

Finally, BlackRock Metals expanded its consultations in 2012, holding meetings with residents of local communities.

3 PROJECT DESCRIPTION

This section presents the main components of the BlackRock Metals project, being the industrial activities and ancillary facilities (garages, storage areas, etc.), as well as the rail line that leaves from the processing plant. It describes the project phases, project components, mineral resource, mining facilities, mine waste management, site water management, support infrastructure and the related project (transmission line).

The plan in Appendix 1 shows the mine site in its natural setting. Appendix 2 shows the project at the end of open pit mining.

The mining facilities are as follows:

- Pit and all associated surface facilities;
- Concentrator and ancillary buildings;
- Covered ore stockpile;
- Fine tailings management facility, with a capacity of 28.8 Mm^3;
- Coarse tailings management facility, with a capacity of 42 Mm^3;
- Waste rock pile, with a capacity of 75.38 Mm^3;
- Industrial water treatment plant and associated facilities.

The supporting infrastructure is as follows:

- Existing access road;
- Rail line and ancillary facilities;
- Port facilities at Saguenay Port;
- Fuel depot and garages;
- Detonator and explosives magazine;
- Service-road network on site;
- Overburden accumulation area;
- Site power grid and substation;
- Construction camp of 500 single rooms and a cafeteria, drinking water supply system and domestic wastewater treatment station; and
- Other miscellaneous buildings and facilities.

3.1 Mining Project

3.1.1 Mineral Resource

BlackRock Metals will mine an iron ore-vanadium mineral from a deposit located in the Lac Doré layered complex, south of Lac Chibougamau. The surface coordinates of the mineralized zones are:

Latitude:	49°48'30" N
Longitude:	74°02'45" W

BlackRock Metals owns the rights to the deposit, in the form of 308 mineral claims covering 5,236 ha (52 km²).

Deposit and Mineralization

The BlackRock Metals deposit is an Fe-Ti-V oxide deposit associated with a stratiform magmatic complex, also called a layered igneous complex, located in the Lac Doré Complex near Chibougamau.

The Lac Doré Complex extends northeast to southwest over a distance of about 24 km, 17 km of which belongs to BlackRock. Two main mineralized zones have been identified on the BlackRock Metals property: the Southwest zone and the Armitage zone, which cover vanadium-bearing ferrogabbro horizons of 2.5 km and 3.3 km, respectively. BlackRock Metals' current development efforts are focused on the Southwest zone, where the mineralized envelope varies in thickness from about 100 to 300 m.

The Southwest zone deposit contains reserves estimated at 152.2 million tonnes (Mt) of ore grading an average of 29.1% iron. BlackRock Metals plans to produce concentrate with an iron content of 62-65%.

3.1.2 Mining Facilities

Mining

The ore will be mined by open pit. The pit will be about 2.8 km long by a maximum of 450 wide and about 280 m deep. The pit will therefore cover a surface area of about 1.26 km².

At full capacity, BlackRock Metals expects to produce nearly 12.4 Mt of ore and 3 Mt of concentrate annually. At the end of the mine life, the mine will have produced 152 Mt of ore, 264 Mt of waste, 7.6 Mt of overburden and 38 Mt of concentrate. Mining and milling activities will take place 24 hours per day, 365 days per year.

Drilling and Blasting

Drilling will be done in the pit using 21.6-cm diameter equipment. A supplier will supply the explosives and will be responsible for on-site storage and management of the explosives. Blasting will be done using an emulsion with an average density of 1.25 g/cm^3.

Ore and Waste Haulage

The ore and waste in the pit will be loaded into trucks by electric-hydraulic shovels with an approximate capacity of 25-m^3 and hauled to surface by 220-tonne trucks.

Pit Dewatering

A system of pumps will keep the pit dry during mining. The pumping rate will vary according to pit depth and season. Mine water will consists primarily of precipitation, snow meltwater and groundwater.

Ore Processing

The ore processing complex will consist of: primary, secondary and tertiary crushers, the ore stockpile and the concentrator building. Attached to the concentrator will be a service building housing offices, an assay laboratory, an infirmary, an electrical/instrumentation shop, a lunchroom, a shower room, an employee changeroom, a compressor room, a boiler room, a breaker room, a training room, a warehouse and a mechanical shop.

The capacity of the concentrator corresponds to the capacity of the equipment to deliver the ore. Like the mining activities, the concentrator will operate 24 hours a day, 7 days a week, on two continuous 12-hour shifts.

3.1.3 Process Description

Crushing

The crusher will be located in building nearest the pit to minimize haulage distance. The primary crusher, which is a 1.52 m x 2.26 m gyratory crusher that can crush up to 4,670 tph, will operate 65% of the time, or about 15.6 hours per day, 7 days per week.

Before being fed to the cone crusher, the ore will be screened, with pieces smaller than 50 mm sent directly to the ore stockpile. The coarse fraction from screening will be crushed to 80% minus 50 mm. The crushed ore will be sent to the ore stockpile, which will have a live capacity of 12.2 hours of plant production, for a volume of 8,972 m^3. This ore stockpile will be covered by a dome and accessible by equipment as needed.

Grinding

The ore will be reclaimed from the ore stockpile by three chain feeders and sent by conveyor to the 11 m x 5.25 m, 15,000 kW semi-autogenous grinding (SAG) mill. The SAG mill will have a capacity of 1,543 tph. At the SAG mill outlet, the ore will be screened (two stages) before being fed to the first stage of magnetic separation. The coarse fraction will be sent back to the 6.4 m x 10.7 m ball mill while the fine fraction will be fed to the second stage of magnetic separation. The final product will be 80% minus 75 microns.

Magnetic Separation

Once ground (SAG and ball mills), the ore will be sent to the magnetic separation units. Magnetic separation will take place in two stages, the first referred to as primary, with single-drum units, and the other secondary, with double-drum units. The magnetic separation feed is in an aqueous medium, meaning that the ore is mixed with water to a density of 40% solids. The primary unit will have a capacity of 1,686 tph solids (3,375 tph of slurry, i.e., ore and water). The unit will consist of eight 1.2 m x 3.2 m cylinders. The non-magnetic tailings will be collected from beneath the separators and will constitute the coarse tailings, which will be fed through hydrocyclones to remove as much water as possible before they exit the mill. The coarse tailings will be piled outside the concentrator by a conveyor before being trucked to the coarse tailings pile, while the fine tailings will be sent to the tailings thickener.

The feed for the secondary stage of magnetic separation will be the fine fraction from the hydrocyclones used with the ball mill. This section will consist of eight 1.2 m x 3.2 m double-drum units, and will have the capacity to receive 762 tph of solid ore, for an equivalent of 3,049 tph of slurry. This stage will separate out the non-magnetic material, which will be sent to the tailings thickener, while the magnetic fraction will be fed to the flotation cells (six cells in series). Reagents will be added to the concentrate in the first cell. The concentrated flotation product, which is the sulphide fraction, will be sent to the tailings thickener.

Concentrate Dewatering

The desulphured magnetite concentrate will be sent to a 27-m thickener located outside the plant, to be thickened to 65-70% solids.

Concentrate Drying

The thickened concentrate will then be sent to filtration stage and filtered using drum filters to a water content of 8.5%. An additional steam drying stage may be added as needed to reduce the water content to 5.5% when required, such as during winter cold spells.

The filtered material will be sent by conveyor to the rail cars, at a feed rate of up to 6,000 tph. An emergency storage area is available in case there is a problem with the train.

Concentrate Loading

Following filtration, the final concentrate is sent outside the concentrator into a storage bin of about 10,000 tonnes, equal to about one day's production. An outdoor emergency storage area is available to provide for any production issues. If this area is used, the material must subsequently be fed back into the storage bin. A front-end loader is used to put the concentrate into a hopper, which feeds it onto the conveyor that takes it to the storage bin. When the time comes to load the rail cars, the concentrate is sent to a 400-tonne loading bin.

3.1.4 Tailings Management

Geochemistry of the Tailings

The results of static and kinetic testing done on the tailings showed that they are neither leachable nor acid-generating.

Tailings Storage

The magnetite concentration process will produce two types of tailings: fine and coarse.

Coarse Tailings Management Facility

The coarse tailings are generated by primary separation, and will be more than 106 microns in diameter. The quantity of coarse tailings to be stored is estimated at 76 Mm^3.

The coarse tailings pile will be built to the west of the pit, and will be adjacent to the fine tailings pond. Because the coarse tailings are dry, they will be piled to an average height of 95 m. The pile will have a footprint of 1.66 Mm^2. A secondary area of 131,478 m^2 is also planned in case of emergency.

Fine Tailings Management Facility

The fine tailings are from the underflow of the thickener and will have a density of 50% solids. This slurry will be pumped to the fine tailings pond using two 250 HP pumps in series.

At the fine tailings pond, the water in the pond will consist of a mixture of process water, mine water and rainwater falling on the surface of the pond. This water will be transferred through a spillway into the polishing pond for a second round of settling. Water will be pumped from the polishing pond to the concentrator to be reused. This recycled water represents 10% of the process water requirements; the remainder will come from the thickener overflow.

The fine tailings pond will be located west of the pit. Dams will be built around most of the perimeter. The dams will have a maximum height of 27 m, and the maximum thickness of the tailings in the pond will be 22 m. About 40 Mt of wet tailings will be deposited for a total volume of 28.8 Mm^3 (water and solids). The tailings deposited in the pond will be flooded to eliminate a source of dust emissions. The aqueous phase on top of the tailings will be transferred to the polishing pond and then recycled to the concentrator or released into the environment through the treatment and monitoring pond, which will allow the standards for mining effluents to be met.

3.1.5 Waste Rock Management

Geochemistry of the Waste Rock

The acid generation potential of the waste rock was tested on 113 waste rock samples. The results showed that the waste rock will not generate acid when exposed to the elements.

Waste Rock Storage

Waste rock will be stored on a pile to be built east of the pit. The overall slope of the pile will be 22 degrees for a maximum elevation of 640 m, which means a maximum thickness of about 140 m of waste rock. The maximum footprint of this pile is about 160 ha for a maximum volume of approximately 250 Mt of stored waste rock.

3.1.6 Site Water Management

During the pre-construction phase, runoff will be directed to polishing pond, which will already have been built. The containment dams at Lac Denis will be built as soon as mine construction begins, raising the lake's capacity to 1.45 Mm^3. The lake will then become a holding pond and will no longer be considered a receiving environment.

Perimeter Ditch Network

The water from the tailings management facilities and waste rock piles or its resurgence will flow into the network of ditches surrounding the property. All the water will end up flowing to a monitoring point downstream from the property. The ditch network is shown on the plan in Appendix 1.

Domestic Wastewater

Two domestic wastewater treatment units will be installed, one for the concentrator and another for the mine garage. These treatment plants will be located close to target facility. The water will be treated using a membrane bioreactor, and the treated water will be discharged into a ditch to flow to Lac Denis via an insulated pipe. The treatment sludge will be collected on a regular basis by a specialist supplier.

Pit Water

The water drained from the pit, which will consist of groundwater and precipitation that falls on the footprint of the pit, will be pumped to the fine tailings pond. The amount of groundwater to be pumped will vary depending on pit depth.

Process Water

BlackRock Metals optimized water recirculation in an effort to minimize the quantity of fresh water pumped from the environment. Process water will mainly consist of water from the thickener overflows and the tailings pond. Aside from the recirculated water in the process water tank, the water required to meet processing needs will come from the polishing pond. This water will be pumped to Lac Denis before entering the processing plant. Process water requirements are estimated at 5,163 m^3/ h.

Polishing Pond Water Treatment Unit

The treatment unit will be located upstream from the polishing pond and is sized to treat a flow of 20,000 m^3/d, thus treating water from peak flows during the spring thaw or heavy rains. The water will be transferred from the fine tailings pond to the polishing pond by pumping. The fine tailings pond, which will have a holding capacity of 28.8 m^3, will also be linked to polishing pond through an emergency spillway. The polishing pond will also be equipped with an emergency spillway allowing the water to flow into the treatment and monitoring pond. The treatment unit is designed to precipitate the suspended solids through the addition of polymers and coagulants. Sludge from the treatment unit will be pumped as needed and sent to the fine tailings pond. Because this sludge consists of agglomerated fine particles, not metallic precipitates, no impact from the redissolution of metals or other parameters is anticipated.

Outlet

Before being released into the environment, groundwater from the pit and runoff from mine site accumulation areas will be treated to meet the water quality criteria of Directive 019 and, to the extent possible, the effluent discharge objectives (EDO) defined by the *Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs* (MDDEFP). The treated water will be discharged into the stream bed upstream from Lac Jean. The flow rate will vary depending on the time of year, with less discharge in winter and during low flow periods.

During the construction years, this stream will be dry because the water from the polishing pond will be pumped to Lac Denis in preparation for plant start-up. There will therefore be no effluent during the construction years, and Lac Jean will be fed by other streams not affected by the project.

3.2 Rail Line

BlackRock Metals will build a 26.6-km rail line segment from the mine site to the CN-owned railway that connects Chibougamau to Lac-Saint-Jean.

The railway right-of-way will be about 18 km wide, for an area of about 48 ha. The grade of the route of the proposed railway generally ranges from 0.00% to 1.40%. Given the relief along the planned railway route, a wye track will be installed at the future mine site, designed to maximize the surface of the wye. Appendix 3 shows the rail line corridor.

The rail line will be used to transport the iron ore concentrate from the future BlackRock Metals mine to the port of Saguenay, with one return trip per day, year-round. Each train will consist of four locomotives and 91 closed rail cars.

3.3 Supporting Infrastructure

3.3.1 Access Roads

Route 167 and logging road 210 will serve as the mine site access road. The only roads that need to be built are therefore the service roads on the mine site itself.

3.3.2 Port Facilities

BlackRock Metals will ship the iron ore concentrate by boat using various multi-user facilities at the Saguenay port (Grande-Anse Maritime Terminal). The main port facilities to be built at the Port of Saguenay are:

- automatic car unloader;
- conveyor with galleries (covered);
- bucket-wheel reclaimer;
- storage (covered and heated in winter);
- tubular or standard conveyor with galleries;
- cargo loader.

3.3.3 Service Facilities

Fuel and Oil Storage and Distribution

The fuel storage areas will be located at least 75 m away from the other facilities. All tanks will be double-wall and equipped with a pump unit, piping and a fueling device. On-site fueling will be carried out by a vehicle with a storage capacity of 18,500 litres.

On-site fuel storage will be supplied by two horizontal, aboveground, ULC-S601 double-wall 40,000-litre tanks for gasoline and eight horizontal, aboveground, ULC-S601 double-wall 50,000-litre tanks for diesel fuel.

Each site will also have the materials needed to fill and drain trucks and any other required equipment. A computerized management system designed to provide automated control of proper fuel use will be installed to track fuel consumption.

Garages and Buildings

The garage where equipment will be maintained will occupy an area of approximately 4,400 m^2, and the adjacent warehouse 4,700 m^2. The building will include a mezzanine housing offices for engineering and mine production, meeting rooms, a cloakroom, bathrooms and a lunchroom. The ground floor will consist of a garage with six repair bays including one wash bay, as well as a machine and welding shop, an electrical shop, a tool storage area, 16 offices, a lunchroom, a change room and a room for daily mine production meetings. The fuel tanks will be located near the garage.

Hazardous waste will also be stored near the garage, as per applicable regulations, and will be transported by specialized firms to an approved treatment site for final disposal.

3.3.4 Overburden Accumulation Areas

Clearing and stripping of the mineralized zone is expected to generate about 7.2 Mt of overburden. The overburden and topsoil will be placed at the western end in the waste rock pile pending use in ongoing site rehabilitation work.

3.3.5 On-Site Power Grid and Substation

The main electrical substation will be located near the concentrator, where power requirements are highest due to the presence of the crusher and the SAG and ball mills. A portable substation connected to a network of cables will be used for power supply in the pit.

3.3.6 Drinking Water Supply

The mine site drinking water will be supplied by an artesian well. Two separate drinking water treatment systems will be set up: one for the processing plant site (125 m^3/day) and the other for the garage site (200 m^3/day). The treatment process includes filtration, chlorination and UV sterilisation.

Drinking water from artesian wells will be stored in a tank and distributed for health needs in all housing units and service areas of the workers' camp.

3.3.7 Recovery, Recycling and Disposal Methods

Debris generated during the construction, operation and closure phases will be disposed of at an MDDEFP-approved site. Recycling and reuse of materials will be encouraged.

3.3.8 Construction Camp

The construction camp will be able to accommodate 500 workers in single rooms. The camp will also house a cafeteria, a medical clinic, a recreation hall and a laundry room. The camp will be equipped with a closed-loop fire protection system. It will be heated by a propane gas system, and electricity will be supplied by an 800-kW generator. The drinking water and wastewater treatment system and final waste disposal are similar to the mine site.

3.4 Related Project – Transmission Line

Project power requirements are estimated at about 49 MW. Power will be supplied by a new 22-km 161-kV line from line No. 1627 (Obalski/Otabogamau), which serves Chibougamau. Hydro-Québec is responsible for building the transmission line.

3.5 Project Phases

3.5.1 Construction Phase

The main construction activities are:

- Building of the construction camp;
- Construction of the polishing pond upstream dam to store the water required for operation;
- Building construction (concentrator, garage, tank installation);
- Rail line construction;
- Preparations for mining: stripping, blasting, separate topsoil and overburden storage;
- Service road construction and ditch development.

3.5.2 Operation Phase

The main production activities are:

- Mining of the ore;
- Concentration of the ore (crushing, grinding, magnetic separation and flotation);
- Deposition of the waste rock in the waste rock pile and of the tailings in the coarse and fine tailings management facilities;
- Equipment and building maintenance;

- Water treatment;
- Environmental monitoring.

3.5.3 Site Closure and Rehabilitation

The mine closure rehabilitation plan was filed with the environmental impact assessment statement issued in 2011. BlackRock Metals then filed a supplemental rehabilitation plan that includes the rail line segment between the mine site and the CN line.

3.6 Human Resources

3.6.1 Jobs

BlackRock Metals will have approximately 260 employees in seven departments: Mine, Concentrator, Maintenance, Engineering, Administration, Human Resources and Environment.

During mine operation, employees whose jobs involve rotating 12-hour shifts will work a 5/4 - 4/5 - 5/5 schedule. Employees with eight-hour-per-day jobs will work a 4/3 schedule.

Employees will be bused from meeting points in the communities of Oujé-Bougoumou, Chibougamau and Chapais to the mine site at the beginning of each shift, and from the mine site to the meeting points at the end of each shift.

3.6.2 Community Relations

BlackRock Metals is committed to interacting and cooperating with the communities in the vicinity of the project. To this end, BlackRock Metals undertook to set up discussion groups in the communities of Oujé-Bougoumou, Chibougamau, Chapais and Mistissini. These discussion groups work by theme, chosen by the participants. In the future, BlackRock Metals plans to develop these discussion groups into a regional group where stakeholders can gather to hear about BlackRock Metals' activities and express their concerns. Following the discussion groups, BlackRock held open house days in communities affected by the project. In all, 379 people came to tour the booths and meet the BlackRock Metals team.

BlackRock Metals is also currently working on an IBA (impacts and benefits agreement) with the Oujé-Bougoumou Cree Nation, the Grand Council of the Crees and the Cree Regional Authority. This agreement will primarily focus on training and employment, working conditions and operating policies, business opportunities, cultural and social considerations, environmental considerations and financial considerations. A summary of the non-confidential items of the agreement can be provided once the agreement has been signed.

3.7 Project Costs

3.7.1 Mine Site

The total capital cost is $609.3 million and includes the purchase and installation of electrical equipment for mining and offsite infrastructure, and the equipment required for grinding, stockpiling, the processing plant, water and waste management, and mining. It also covers indirect costs such as the owner's cost, engineering, construction and production start-up, as well as contingencies.

Annual operating costs are expected to be $188.9 million for the first seven years, and to then increase to $191.8 million annually from the eighth to the tenth year of operation and decrease to $174.1 million/year in subsequent years. Operating costs cover mining, processing, general and administrative expenses, handling and transport to the port.

3.7.2 Rail Line

In terms of railway construction, total project costs are estimated about $67 million, or about $2,500,000/km of track. It should be noted that project costs do not include a provision for the acquisition of rolling rail stock.

3.7.3 Rail Service at the Grande-Anse Marine Terminal

The total estimated cost for the facilities at the rail service and the Grande-Anse port, namely the multi-user facilities for unloading the train, storing the materials, conveying it to the port facilities and cargo loading, is approximately $100 million.

4 OVERVIEW OF THE HOST ENVIRONMENT

4.1 Physical Environment

The Chibougamau area is characterized by a subpolar, subhumid continental climate.

Physiography and Geology

Except for a few hills in the vicinity of the mine site, the study area is characterized by flat topography with a fairly continuous cover of surficial materials.

The average elevation is 420 m above sea level, while the deposit hill peaks at 533 m. The many lakes, streams, wetlands and waterholes attest to the gentle slope of the terrain and low surface permeability.

The bedrock straddles the Precambrian-age Superior structural province (mine site) and the Grenville structural province (Domaine-du-Roy RCM), and consists of metasedimentary and igneous rocks. The rock formations strike northeast-southwest.

4.1.1 Surficial Materials

Bedrock

The bedrock is composed of weakly metamorphosed volcano-sedimentary rocks of the Lac Doré Complex and igneous rocks of the Lac Chibougamau Complex.

These rocks are generally hard, massive, impermeable and relatively unaltered on surface. Outcrops are mostly found in the area of the mine site, and are much like the hills of the deposit.

Glacial Deposits

Most of the local study area is covered by glacial till lying directly on the bedrock. The till lacks bedding structure (ground moraine), and is made up of components of various sizes, with a potentially-high of fine particles (silt and clay). The till often has poor drainage, but has very good bearing capacity. The water table is often close to surface (1 m or less).

The glacial till includes drumlins, small elongated northeast-southwest hills up to a kilometre long and some 10 m high. These are coarse deposit (boulders, pebbles, sand and gravel), generally looser than the ground moraine till, with good drainage. The drumlins have steeply-sloping sides (10%) and flat tops. Drumlin till can be found throughout the area and is a suitable source of granular material.

Organic Deposits

Organic deposits are found in flat terrains and hollows often found at the edge of streams and lakes. They are made up of somewhat decomposed organic matter and are scattered throughout the study area, often overlying the till or alluvial deposits beside streams and lakes undergoing eutrophication.

The largest areas of organic deposits are found around Lac Jean and Lac Bernadette (mine site). The deposits are water-saturated and 1 to 3 metres thick, with high compressibility.

4.1.2 Hydrology and Hydrogeology

The study area is drained by two large river basins: the St. Lawrence River watershed to the east and the James Bay watershed to the west. The drainage divide coincides with the border between the Domaine-du-Roy RCM and the Municipality of Baie-James, and crosses the southwestern part of the town of Chibougamau.

Generally speaking, underground runoff is affected by the relatively steep topography around the mine site and the type of surficial material present, which is characterized by poor drainage and low permeability (glacial till). The bedrock surface under the surficial deposits is fissured.

4.2 Biological Environment

4.2.1 Vegetation

The entire study area is in the black spruce-moss forest bioclimatic domain, which is the largest bioclimatic domain in Quebec. The main species found are black spruce, fir, trembling aspen, balsam poplar, tamarack, jack pine, white birch and white spruce. Deciduous trees are often found as isolated patches and along roads, and tend to be trembling aspen and white birch.

The area's vegetative cover has been somewhat disturbed by logging over the years. Cutting has spread steadily since the 1950s, and is now the main cause of environmental disturbance.

4.2.2 Wetlands

The mining project and rail line construction entail activities that affect wetlands. Eight wetland categories were identified: ponds, marshes, open bogs, open fens, flooded swamps, shrub swamps, poor conifer swamps and rich conifer swamps.

Wetlands consisting mainly of marshes and poor conifer swamps account for 326.5 ha of the mine site, or 20.45% of the total property area.

The railway study area comprises 797.6 ha of wetlands, representing 31% of its total area. Treed peatlands, bogs and shrub swamps are the main types of wetlands in the study area.

4.2.3 Wildlife

Mammals

Wildlife in the study area is composed of species commonly found in boreal forest. Mammals seen in the area are moose, wolf, red fox, black bear, porcupine, beaver, eastern chipmunk, groundhog, river otter, snowshoe hare and lynx.

Other mammal species likely to be encountered in the area and valued by traditional land users are the muskrat, American marten, American mink, fisher and ermine. The list of mammals also includes skunk, other small mammals (mouse, vole, shrew) and a few bat species.

Birds

The following species have been observed in the study area: spruce grouse, common raven, thrushes, ruffed grouse, black-capped chickadee, white-throated sparrow, Canada jay, common yellowthroat and northern flicker.

Birds of prey in the study area include the osprey, American kestrel, red-tailed hawk, bald eagle and golden eagle.

About 197 migratory bird species are listed for the region, of which 80 are confirmed to be present in the Chibougamau region. However, the data only shows 64 confirmed to breed in the region.

There are also many aquatic species, including 14 species of Anatidae (geese and ducks), whose habitat is closely associated with lakes and shores, as well as the common loon, great blue heron, spotted sandpiper, greater yellowlegs, Wilson's snipe and American bittern, which are also associated with aquatic environments (ponds, lakes, streams) and wetlands (marshes, grassy banks, etc.). Most of the other bird species are passerines (39 species), which are generally associated with woodlands.

Amphibians and Reptiles

The study area's numerous lakes and other wetlands constitute favourable habitats for a number of amphibian and reptile species. These include the northern two-lined salamander, American toad, northern spring peeper, green frog, mink frog, wood frog, leopard frog, eastern spotted newt and common garter snake.

Fish

There are several species of fish in the area of the mine site, the main ones being: northern pike, brook trout, white sucker, perch, burbot and fallfish. Several small species are also present, such as longnose dace, northern redbelly dace, pearl dace, trout-perch, brook stickleback and mottled sculpin.

Wildlife Habitats

Earlier wildlife habitats have been somewhat disturbed by intense logging in certain sectors, including the future mine site.

A number of moose winter habitats have been identified near the mine site. In wintertime, moose sometimes occupy some of the areas that will be affected by mining activities. Beavers have also built dams on most of the streams. A walleye spawning ground and a few small potential spawning grounds for brook trout are located in the vicinity of the future mine site.

It should be noted that the mining project is not located in a currently protected or ecologically important area.

4.2.4 Special-Status Species

Threatened and Vulnerable Vascular Plant Species

The sources consulted in a supplementary study on the biological environment in the study area point to the potential presence of 14 special status species in the study area. Of these, four are calcicolous plants, several occurrences are well removed from the study area, and some species have specific habitats that are uncommon in the study area. Of all the habitats encountered, cedar groves, peatlands (treed peatlands, fens and bogs), disturbed sandy sites, rock outcrops and lakes are most likely to host special status plants.

The *Centre des données sur le patrimoine naturel du Québec* (CDPNQ) mentions the presence of two vascular plants with special status within a 100-km radius of the study area, namely dragon's mouth (*Arethusa bulbosa*) and lavender bladderwort (*Utricularia resupinata*). In addition, the range of the ostrich fern (*Matteuccia struthiopteris*) in Quebec suggests that this plant may be present in or around the study area.

None of the vascular plant species on the Canadian Wildlife Species at Risk list have been observed in the study area.

Wildlife Species at Risk, Threatened, Vulnerable or Likely to be Designated as Such

Mammals

Overall, six at-risk species of mammals are likely to be found in or around the study area. Results of requests for information made in 2011 reveal that the rock vole and silver-haired bat have been reported within 10 km of the mine site. Based on the habitats present in the study area and knowledge of species biology, the species most likely to be present are the eastern red bat, hoary bat, silver-haired bat, southern bog lemming and rock vole.

Birds

Nine species at risk have been reported from the region surrounding the study area. Five of these were observed during the 2012 surveys and four potentially breed in the study area. Species at risk that were not observed are unlikely to be found in the study area, as their unique type of nesting habitat is not found in the study area.

The two most common and abundant species at risk in the study area are the olive-sided flycatcher and rusty blackbird.

4.3 Human Environment

4.3.1 Land Use

The territories of the Municipality of Baie-James and the town of Chibougamau lie on Category III land as defined in the JBNQA. The Crees' hunting and fishing rights on these lands are enshrined in the JBNQA. The mine and mining infrastructure lie on trapline O-59. The northeast edge of the mining area (Lac Laugon area) corresponds to trapline O-57/M-57, whose ownership is under discussion by the communities of Oujé-Bougoumou and Mistissini.

The project area is regularly used for blueberry picking, as well as for partridge, waterfowl, bear and moose hunting. Fishing takes place mainly on Lac Chibougamau, and to a lesser extent on Lac Armitage.

Members of the Wapachee family are the main users of the wildlife resources in the study area. Their moose hunting grounds are located east of Lac Armitage, near Lac Laugon. They trap many fur-bearing species and hunt Canada geese and several species of duck along Rivière Armitage and Ruisseau Villefagnan.

In the area of the proposed rail line, traplines O-59 and O-60 of the community of Oujé-Bougoumou occupy the entire local study area. Trapping in these two areas is reserved exclusively for Aboriginal peoples.

The rail line local study area is located in sports hunting zone 17 and partially overlaps zone 28. Note that caribou hunting is permitted in hunting zone 17, and Canada geese and several species of ducks are also hunted in the study area.

The other activities that take place in the two study areas are associated with forestry, mining and extensive tourism. There are no permanent residences near the proposed mine site or railway line. However, a lease to operate a commercial resort and the Wapachee family's main seasonal camp (Rabbit camp) are found west of the proposed rail line, but as the tallyman has agreed to relocate the Rabbit camp outside the mining project's area of influence, and the camp will not be considered a component of the built environment.

4.3.2 Archaeology

The only known archaeological site in the local study area (DkFn-1) is on the eastern shore of Lac Chibougamau, south of Île des Commissaires, about eight kilometres from the mine site.

The archaeological potential was assessed throughout the local study area to identify areas where traces of human occupation might be found. A survey of such areas was done in the summer of 2011. Some 550 pits were dug, but failed to produce anything.

4.3.3 Consultations

Meetings with the various local stakeholders were held within the scope of the Lac Doré Complex environmental impact assessment. BlackRock Metals and its representatives have had discussions with stakeholders since July 2010, mainly with First Nations including the tallyman of trapline O-59, the *Ministère des Ressources naturelles* (MRN), the MDDEFP, the Canadian Environmental Assessment Agency, the Department of Fisheries and Oceans Canada, Environment Canada, municipal governments including those of Chibougamau and the Municipality of Baie-James, and local and regional agencies. These meetings involved the mining project and its components, but did not cover the proposed railway project.

The goal of such meetings is to take stock of stakeholders' concerns and their knowledge of the environment so as to develop a project that allows for these elements to the greatest extent possible. BlackRock Metals intends to continue interacting with local stakeholders and the general public over the entire life of the project.

A number of communication and consultation meetings took place while the railway option was under study. These were held in the context of ongoing discussion committee meetings, interviews for the documentation of Cree traditional knowledge and open house days. BlackRock Metals is pursuing its regular practice of consulting and informing the communities.

5 IMPACT AND MITIGATION MEASURES

The anticipated impact and benefits for the most sensitive components (for which the impact or benefit is moderate or higher) during the various project phases are presented below. The current and specific mitigation measures to be implemented and positive measures to be taken are also summarized.

The global assessment of the environmental impact of the construction, operation and closure phases for the mine and the rail line segment on the physical, biological and human environments is presented in Chapter 8.

5.1 Impact on the Physical Environment and Mitigation Measures

During the construction phase, the general construction activities required to build the various project facilities are clearing, blasting, excavation and earthworks, stream crossings, and construction of access roads and other related structures. These activities are potential sources of direct impact on various components of the physical environment.

During the operation phase, the main sources of impact likely to affect the physical environment are: mining activities in the pit, waste and tailings disposal, water and runoff management, management of wastewater and contaminants, transport, railway operation and maintenance and general processing plant and crusher operation.

However, once the various mitigation measures proposed within the scope of the studies on the mining complex and railway line are accounted for, the residual impact on the physical environment from the various project phases are all considered minor or low.

5.2 Impact on the Biological Environment and Mitigation Measures

During the construction phase, the main sources of direct impact on the various components of the biological environment are the clearing work and general construction activities required for mine and rail line development.

The main sources of direct impact during the operation phase are the mining activities, mine waste management and the presence of the production facilities and support infrastructure.

In addition, the water encroachment caused by the presence of the waste rock piles and tailings management facilities, stream diversion and the establishment of a drainage system are sources of indirect impact that could affect wildlife, as are the presence of workers and the intensive use of the access road during the construction and operation phases.

The application of the many mitigation measures presented in the mine site and rail line studies greatly reduce the residual impact on the various components of the biological environment. The residual impact on the biological environment resulting from various phases of the mine and rail line projects are all considered minor or low.

5.3 Impact on the Human Environment and Mitigation Measures

5.3.1 Construction Phase

Negative Impact

The likely sources of negative impact on the various components of the human environment during the construction phase are the clearing, excavation, blasting, construction and development work, as well as increased traffic on logging road 210 and the mere presence of workers on the construction sites (mine and rail line).

In terms of the rail line, the anticipated sources of a residual impact of moderate significance are: the loss of 47 hectares of forest for trap line users, increased noise levels, increased wildlife harvesting by workers outside working hours, and the safety risk for Aboriginal users travelling to their camps and hunting and gathering sites due to increased traffic on the various logging roads.

The impact on cultural heritage will also be felt at the northern end of the railway, where a first moose kill site will be affected by railway construction.

The mitigation measures to be applied to minimize the impact on the human environment during rail line construction are:

- provide for appropriate signage and, if necessary, site restriction measures;
- confine equipment travel to defined routes within the work area;
- identify specific worker parking areas;
- clean the roads used by construction machinery and equipment regularly;
- use environmentally-friendly dust control methods in problem areas.

The following specific mitigation measures will also be applied:

Before the work starts:

- consult with the tallyman and his family regarding the appropriate mitigation measures, as requested during the consultations;
- relocate and rebuild the Rabbit camp;
- meet with the tallyman and give him a work schedule that includes a description of the nature of the activities (clearing, blasting, excavation, etc.).

During work:

- maintain communications between BlackRock Metals and the tallyman to avoid any issues with land users.

No residual impact (moderate or higher) on the human environment was identified for mine site construction.

Benefits

Sources of impact likely to positively affect the various components of the human environment during the construction phase are related to the acquisition of goods and services and the generation of tax revenues from employee and corporate earnings.

The anticipated residual benefits of moderate significance or higher relate to job creation and economic benefits for local and regional suppliers, which will support the local population and the regional economy. The following positive measures will be taken:

- BlackRock Metals and the local community will set up manpower training programs for aboriginals and non-aboriginals so as to meet manpower requirements;
- Establishment of a discussion group with members of the Oujé-Bougoumou Cree community, particularly for the discussion of socioeconomic issues. An impact and benefits agreement (IBA) is currently being prepared and will cover subjects such as: training, jobs and business opportunities for the Crees, culture and environment;
- Cooperation between BlackRock Metals and regional employment centres;
- Preferential hiring of manpower and contractors from Oujé-Bougoumou, Chibougamau and Chapais, followed by the neighbouring regions (Saguenay–Lac-Saint-Jean and Abitibi–Témiscamingue);
- Creation of a round table to develop and monitor the economic benefit optimization strategy.

5.3.2 Operation Phase

Negative Impact

Sources of impact likely to negatively affect the various components of the human environment during the operation phase are the track usage, maintenance and repair activities and the presence of permanent and ancillary facilities, as well as the production facilities at the mine site.

No significant residual impact (moderate or higher) on the human environment is anticipated during the operation phase for the mine site or the railway line.

Benefits

Sources of impact likely to positively affect the various components of the human environment during the operation phase are related to the acquisition of goods and services and the generation of tax revenues from employee and corporate earnings.

The anticipated residual benefits of moderate significance or higher relate to job creation and maintenance and economic benefits for local and regional suppliers, which will support the local population and the regional economy.

The following positive measure will be taken:

- Preferential hiring of local workers insofar as they have the required skills at the time of hiring.

5.3.3 Closure Phase

Negative Impact

Sources of impact likely to negatively affect the various components of the human environment during the closure phase arise primarily from the closure of the facilities and the end of railway use and maintenance.

The anticipated residual impact on the human environment of moderate significance or higher relates to the job losses and declining spending in the region that could affect the local population and regional economy. No mitigation measures are planned in this regard for the closure phase.

6 CUMULATIVE IMPACT

Assessment of the cumulative impact helps relate the project to the other anthropogenic alterations that characterize the host environment and have an impact on the people living there. This makes it possible to gain a better appreciation of the project's potential for insertion into a changing environmental and social context with a minimal risk of impact.

Moreover, in addition to the mining project and the BlackRock Metals project to build a 26-km rail line segment, this cumulative effects analysis takes into consideration Hydro-Québec's 161-kV transmission line and the rail service and marine facilities at Port Saguenay, which will receive the iron ore concentrate.

6.1 Lakes and Streams

The mining project will affect part or all of many natural lakes and streams. However, the route of the railway line only crosses one permanent stream, with all the other streams crossed being intermittent. There are also other lakes and streams in the region affected by past, present or future mining activities (future projects often being the potential reopening of old projects). However, the effect is spread out over both time and space.

The railway will cross a few streams. However, the surveys conducted suggest that the free movement of fish will only be required at one crossing (Jules bridge), because the others do not have fish habitats.

The multi-user facilities at the marine terminal will not require work in a body of water.

The cumulative impact on lakes and streams will be limited, as the other past, present or future projects are spread out, both in space and in time. In addition, these projects are controlled by clear regulations that include the implementation of mitigation and compensation measures.

6.2 Traditional Land Use

While low intensity, a cumulative impact will be felt on the traditional activities practiced in the regional study area. BlackRock Metals has held numerous meetings with land users to ensure that the impact is minimal, and the users have even agreed to move and replace their current hunting camp (Rabbit camp).

6.3 Use of the Area for the Exploitation of Other Resources

The exploitation of other resources (mining, logging, fishing and hunting) could be affected by regional activities and the current mining and rail line project.

The mining of the iron ore deposit of the Lac Doré geological complex by BlackRock Metals will not directly affect other mining operations in the region, whether past, present or future.

The clearing required for the project will not affect logging activities, given the small area affected compared to the vast territory covered by forests.

Other local activities as well as those related to the project will not affect the current hunting and fishing activities in the region.

Daily use of a train (round trip) between the BlackRock Metals plant and the port of Saguenay will only have a low impact on the municipalities along the route, given that the pressure was higher in the past.

Activities and multi-user facilities at the Saguenay marine terminal will not affect the exploitation of other resources in the area.

Given that timber is a renewable resource, mines are operated over many decades and a vast territory, the mineral potential is very high and companies even plan to reuse old areas that have once again become economically viable, the cumulative impact of these projects remains low.

6.4 Jobs and the Economy

The various activities in the study area, both mining and other, are generally independent, and do not affect each other's economics. If future forestry activities are planned in the vicinity of the study area, proper planning will allow activities to be coordinated and any negative impact to be avoided.

Thus, the BlackRock Metals project (mine and railway) will have direct positive effects on jobs and local and regional economic benefits. The cumulative impact is expected to be positive, as it would be for any regional project.

6.5 Birds

In combination with other resource exploitation activities in the region, the clearing work required for the BlackRock Metals project (mine and railway) could have an impact on bird nesting and bird habitats.

According to the various sources consulted and the surveys conducted, the study area and the surrounding region are likely to be frequented by 145 species of birds on an annual basis. Expected losses were assessed based on the various surveys

done and the habitats found in the railway study area: one breeding pair for waterfowl, none for birds of prey, 190 breeding pairs for land birds and one breeding pair for shorebirds.

6.6 Wetlands

Construction of mining facilities will affect approximately 204 ha of wetlands (peatlands, swamps, marshes), representing about 0.03% of the study area chosen for the impact assessment (70,000 ha). For the railway, only 16.4 ha of wetlands would be affected. The main losses are in peatlands, which are also forest stands that support volumes of merchantable timber, or at any rate did so prior to logging.

The loss of wetlands may affect certain species of migratory birds. The route of the railway has been optimized to have the least possible impact on the natural environment, including wetlands. Precautionary measures have also been proposed to keep drainage as natural as possible.

Because wetlands are abundant in the Chibougamau area, the cumulative effect for wetlands would be limited because other past, present or future projects are spread out from each other, in both space and in time. The most recent projects have been optimized and take wetlands into consideration. In addition, wetland losses caused by the BlackRock Metals project (mine and railway) will eventually be the focus of an offset project, and an environmental monitoring program will be prepared and submitted to government agencies as necessary.

6.7 Summary of the Net Cumulative Impact

The following table summarizes the net cumulative impact on the selected VECs for the BlackRock Metals project (mine and railway).

Valued Environmental Component	**Net impact**
Lakes and streams	Small negative
Traditional land use	Small negative
Use of the area for the exploitation of other resources	Small negative
Jobs and the economy	Moderate positive
Birds	Small negative
Wetlands	Small negative
At-risk species	Small negative

7 ENVIRONMENTAL MONITORING AND FOLLOW-UP

7.1 Monitoring Program

The environmental monitoring program is intended to ensure optimal integration of the project to the environment during construction and operation. The goal of the program is to monitor the implementation of the various prescribed mitigation measures and ensure their effectiveness.

The main issues to be considered by a monitoring program for the construction and operation phases are:

- management of mine wastes, including proper separation of fine and coarse tailings;
- identification of advanced warning signs of possible failure of mine waste management equipment and facilities;
- drainage water control and treatment;
- process water and final effluent quality control;
- atmospheric emissions (particulate matter and greenhouse gases);
- noise levels from project activities;
- sourcing and management of borrow materials;
- construction of haulage roads with low-silt materials;
- application of dust control agents on haulage and access roads;
- management of stripped mineral and organic soil;
- ongoing and final site rehabilitation;
- protection of streams, vegetation and wildlife habitats;
- environmental auditing of chemicals, hydrocarbon and waste management quality;
- protection against accidental spills;
- drinking water and wastewater quality control.

7.2 Follow-up Plan

The corporate environmental follow-up plan covers the operation and closure phases of the project, as well as post-closure. The goal of the environmental follow-up plan is to ensure the effectiveness of mitigation measures and the monitoring program in general, and to take corrective action as needed.

The environmental follow-up plan is also a way to assess the operational effectiveness of the technological risk management plan, at least as far as the environmental portion of the plan is concerned.

8 GLOBAL ASSESSMENT

The natural and human environments have sensitive components that require special attention before, during and after construction and operation. The environmental components affected by the project[1] and the planned mitigation measures for minimizing the negative effects are summarized in Table 8.1 for the proposed mine site and in Table 8.2 for the proposed rail line, while the affected areas are shown in Table 8.3.

Given the changes to and the new use of the host environment, most of the effects on the natural environment are negative. These, however, can be mitigated in the short, medium and long-term, and there are positive effects on the human environment, specifically in terms of jobs and the economy.

The residual impact is the impact that persists on the environmental components despite the application of mitigation measures. In general, residual impact ranges from minor to nil.

In addition, the establishment of a risk management system for technological accidents and emergency response plans for occupational health and the environment will also help prevent and contain certain potential accidents associated with the project. Finally, environmental monitoring and follow-up and rehabilitation plans are other measures that will help reduce or eliminate the project's negative environmental impact.

[1] Tables 8.1 and 8.2 are summaries of the environment and social impact assessment statement prepared by ENTRACO Inc. in 2011 and the supplementary study on the building of a new rail segment for the BlackRock Metals mining project prepared by GENIVAR in 2012, respectively.

Table 8-1: Environmental Impact and Mitigation Measures for the Mining Project

Environ-ment Affected	Component Affected	Description of Impact	Phase	Activity	Component Resistance	Impact			Current Mitigation Measures[1]	Specific mitigation Measures[1]	Residual Impact
						Intensity	Scope	Significance			
SOIL	Surface materials	• Alteration of the soil profile, erosion • Loss of original soil • Soil compaction • Risk of contamination through spills	Construction	• Clearing • Borrow pits • Excavation and earthworks • Access and mine roads • Transportation and traffic	Very low	Moderate	Limited	Minor	18 current mitigation measures	2 specific mitigation measures	Minor to nil
			Operation	• Mining – pit • Tailings deposition							
	Wetlands	• Loss of wetlands • Risk of contamination through spills	Construction and Operation	• Clearing • Excavation and earthworks, waste management facilities and dams • Water flow management	Very high	High	Limited	Major	60 current mitigation measures	2 specific mitigation measures	Minor
WATER	Lakes and streams	• Alteration of run-off, infiltration and the flow network • Increased sediment flow in streams and wetlands • Loss of small lakes and streams • Loss of fish habitat • Risk of contamination through spills	Construction	• Clearing and site preparation • Blasting, excavation and earthworks • Access and mine roads	Very high	High	Local	Major	52 current mitigation measures	3 specific mitigation measures	Minor
			Operation	• Mining – pit • Water management • Tailings deposition • Transportation and traffic							
	Groundwater	• Risk of contamination through spills • Contamination by leachates and wastewater	Construction	• Transportation and traffic • Excavation and earthworks • Management of wastewater and contaminants	Moderate	Moderate	Limited	Minor	14 current mitigation measures	2 specific mitigation measures	Minor
			Operation	• Mining – pit • Tailings deposition • Management of wastewater and contaminants • Transportation and traffic							
AIR	Air quality	• Deterioration of air quality by suspended particles and greenhouse gas (GHG) emissions	Construction	• Transportation and traffic • Excavation and earthworks	High	Low	Local	Intermediate	6 current mitigation measures	6 specific mitigation measures	Minor
			Operation	• Mining – pit • Plant and crusher • Transportation and traffic							
	Noise	• Increase in the noise levels and deterioration in the sound environment in the vicinity of the mine site and access road	Construction	• Transportation and traffic • Blasting, excavation and earthworks	High	High	Limited	Intermediate	2 current mitigation measures	10 specific mitigation measures	Minor (below the 40 dB(A) limit 250 m from the access road and 2 km from the mine site)
			Operation and maintenance	• Mining – pit • Plant and crusher • Transportation and traffic							

Table 8-1: Environmental Impact and Mitigation Measures for the Mining Project (Cont'd)

Environ-ment Affected	Component Affected	Description of Impact	Phase	Activity	Component Resistance	Impact			Current Mitigation Measures[1]	Specific mitigation Measures[1]	Residual Impact
						Intensity	Extent	Significance			
Plants	Habitats and species	• Elimination of vegetation • Loss of commercial timber space • Theoretical loss of threatened species or species likely to be designated as such	Construction Operation and maintenance	• Clearing • Excavation and earthworks • Access and mine roads • Mining - pit • Tailings deposition • Presence of production and support equipment	Low	Low	Limited	Minor	18 current mitigation measures	2 specific mitigation measures	Minor
Wildlife	Habitats and species	• Loss of habitat for certain animal species • Higher risk of collisions with animals • Increased fishing due to the presence of workers	Construction Operation and maintenance	• Labour • Clearing • Excavation and earthworks • Access and mine roads • Transportation and traffic • Labour • Mining – pit • Tailings deposition • Transportation and traffic	Moderate	Moderate	Local	Intermediate	11 current mitigation measures	6 specific mitigation measures	Minor
Human Environment	Built environment	• Heavy, intense, regular traffic at all times • Higher risk of road accidents • Deterioration of air quality and the sound environment due to traffic	Construction and operation	• Transportation and traffic	High	High	Limited	Intermediate	3 current mitigation measures	1 specific mitigation measures	Nil
	Land use	• Heavy, intense, regular traffic at all times • Restricted access to mine site areas • Conflicting land use by traditional, logging and mining activities • Higher risk of accidents with other users • Deterioration of air quality and the sound environment	Construction Operation and maintenance	• Transportation and traffic • Clearing • Excavation and earthworks • Access and mine roads • Transportation and traffic • Mining – pit • Plant and crusher • Tailings deposition • Transportation and traffic	High	High	Local	Major	66 current mitigation measures	4 specific mitigation measures	Minor
	Jobs and the economy	• Investment in the region • Increased activity in the region • Job creation for local and regional manpower and businesses • Economic stimulation	Construction and operation	• All activities	N/A	N/A	Regional	Positive	N/A	1 specific mitigation measures	Positive
	Landscape quality	• Introduction of anthropogenic components visible from Lac Chibougamau	Construction and operation	• Tailings management facilities	Moderate to high	Minor to nil	Low	Intermediate to minor	N/A	2 specific mitigation measures	Minor

[1]Source: Entraco Inc. (2011). *Environmental and Social Impact Assessment Statement – Iron Ore Mine, Volume 3 –Appendices.*

Table 8-2: Environmental Impact and Mitigation Measures for the Rail Line Project

Environment affected	Component affected	Description of the Impact	Phase	Activity	Current and specific mitigation measures[1]	Impact Assessment						Residual Impact
						Nature	Degree of disturbance	Intensity	Extent	Duration	Probability	
Soil	Soil quality	• Erosion • Modified nature of the soil of 48 ha • Rutting; modified soil cohesion • Risk of contamination through spills	Construction	• Clearing • Stripping and levelling • Excavation and earthworks • Transportation and traffic	9 current and 1 specific mitigation measures	Negative	Moderate	Low	Limited	Short to long	High	Low
			Operation	• Transportation and traffic • Presence and use of the railway track • Chemical weeding activities	3 current and 2 specific mitigation measures	Negative	Low	Low	Limited	Short to long	Low	Low to very low
		• Re-establishment of tree cover • Reduction in sensitivity to soil erosion	Closure	• Decommissioning • Rehabilitation • Contaminated site rehabilitation	Same as for construction	Positive	Moderate	Low	Limited	Long	High	Low
Water	Drainage network	• Disturbance of the natural flow regime • Modification of the local flow regime (increased runoff) • Temporary modification of the natural flow regime	Construction	• Clearing • Stripping and levelling • Water flow management	1 current mitigation measure	Negative	Low	Low	Local	Long	High	Low
	Surface water and groundwater quality	• Increase in the transportation of sediments into aquatic environments • Risk of contamination from spills	Construction	• Clearing • Stripping and levelling • Excavation and earthworks • Transportation and traffic • Stream crossings	11 current and 2 specific mitigation measures	Negative	Low	Moderate	Limited	Short	Moderate	Low
			Operation	• Maintenance activities • Presence and use of the railway track • Chemical weeding activities	4 current and 1 specific mitigation measures	Negative	Low	Moderate	Limited	Short to long	Low	Low to very low
			Closure	• Decommissioning	Same as for construction	Negative	Low	Moderate	Limited	Short	Moderate	Low

Table 8-2: Environmental Impact and Mitigation Measures for the Rail Line Project (Cont'd)

Environ-ment affected	Component affected	Description of the Impact	Phase	Activity	Current and specific mitigation measures[1]	Impact Assessment						Residual Impact
						Nature	Degree of disturbance	Intensity	Extent	Duration	Probability	
Air	Air quality	• Dust and GHG emissions • Increased airborne dust concentrations	Construction	• Blasting, excavation and earthworks • Borrow pits • Transportation and traffic	5 current and 1 specific mitigation measures	Negative	Low	Low	Local	Short	Moderate	Very low
			Operation	• Transportation		Negative	Low	Low	Limited	Long	High	Low
			Closure	• Equipment use		Negative	Low	Low	Local	Short	Moderate	Very low
	Noise	• Increased noise levels and deterioration of the sound environment in the vicinity of the railway line	Construction	• All construction work	4 current mitigation measures	Negative	Low	Moderate	Limited	Short	Moderate	Low
			Operation	• Maintenance activities • Train transport		Negative	Low	Moderate	Limited	Long	Low	Low
			Closure	• Decommissioning	2 current mitigation measures	Negative	Low	Moderate	Limited	Short	Moderate	Low
Vegetation	Forests	• Loss of 47 ha of forest vegetation	Construction	• Clearing • Transportation and traffic	4 current and 2 specific mitigation measures	Negative	Low	Low	Limited	Long	High	Low
		• Rehabilitation of the right-of-way • Revegetation with indigenous species	Closure	• Rehabilitation	4 current and 2 specific mitigation measures	Positive	Low	Low	Limited	Long	High	Low
	Wetlands	• Loss of 17 ha of wetlands	Construction	• Clearing • Transportation and traffic	4 current and 4 specific mitigation measures	Negative	Low	Low	Limited	Long	High	Low
		• Re-establishment of the natural flow regime • Revegetation with indigenous species	Closure	• Rehabilitation	4 current and 1 specific mitigation measures	Positive	Low	Low	Limited	Long	High	Low
	Special status vascular plants	• Loss of certain special status vascular plants	Construction	• Clearing • Transportation and traffic	Same as for wetlands	Negative	Low	Moderate	Limited	Long	Low	Low

Table 8-2: Environmental Impact and Mitigation Measures for the Rail Line Project (Cont'd)

Environ-ment affected	Component affected	Description of the Impact	Phase	Activity	Current and specific mitigation measures[1]	Impact Assessment						Residual Impact
						Nature	Degree of disturbance	Intensity	Extent	Duration	Probability	
Wildlife	Fish	• Disturbance of fish • Temporary disturbance of environmental quality • Temporary encroachment • 1,400 m^2 encroachment on fish habitat	Construction	• Clearing • Excavation and earthworks • Stream crossings	5 specific mitigation measures	Negative	Moderate	Moderate	Limited	Short	Moderate	Low
			Closure	• Decommissioning • Opening of culverts	Same as for construction	Negative	Low	Low	Limited	Short	Moderate	Very low
Wildlife	Herpetofauna	• Loss 64 ha of habitat • Disturbance of herpetofauna	Construction	• Clearing • General construction activities	5 current and 1 specific mitigation measures	Negative	Low	Low	Limited	Long	High	Low
		• Rehabilitation of tree cover and habitats	Closure	• Rehabilitation	5 current and 2 specific mitigation measures	Positive	Low	Low	Limited	Long	High	Low
	Birds	• Disturbance of the sound environment • Loss of 64 ha of habitat • Loss of nesting grounds	Construction	• Clearing • General construction activities	3 current and 1 specific mitigation measures	Negative	Low	Low	Limited	Long	High	Low
		• Disturbance of birds	Operation	• Rail transport	None	Negative	Low	Low	Limited	Short	Low	Very low
		• Return to the initial sound environment • Revegetation of the railway corridor • Gradual return of herbaceous plants and trees	Closure	• Rehabilitation	3 current and 1 specific mitigation measures	Positive	Low	Low	Limited	Long	Moderate	Low
	Mammals	• Disturbance of the sound environment • Loss of 64 ha of habitat • Collision risk	Construction	• Clearing • General construction activities	5 current mitigation measures	Negative	Low	Low	Limited	Long	High	Low
		• Disturbance of wildlife	Operation	• Rail transport	None	Negative	Low	Low	Limited	Long	High	Low
		• Return to the initial sound environment • Revegetation of the railway corridor • Gradual return of herbaceous plants and trees	Closure	• Rehabilitation	5 current and 1 specific mitigation measures	Positive	Low	Low	Limited	Long	High	Low

Table 8-2: Environmental Impact and Mitigation Measures for the Rail Line Project (Cont'd)

Environ-ment affected	Component affected		Description of the Impact	Phase	Activity	Current and specific mitigation measures[1]	Impact Assessment						Residual Impact
							Nature	Degree of disturbance	Intensity	Extent	Duration	Probability	
Human Environment	Land Use	Built environment	• Increased dust and noise levels • Disturbance of the commercial resort tenant	Construction	• All construction activities	2 current mitigation measures	Negative	Moderate	Low	Limited	Short	Moderate	Very low
				Operation	• Rail transport • Maintenance and repair activities	None	Negative	Low	Low	Limited	Long	High	Low
				Closure	• Decommissioning	1 current mitigation measure	Negative	Moderate	Low	Limited	Short	Moderate	Very low
		Road infrastructure	• Increased traffic on Route 167 and logging road 210 • Temporary suspension of rail traffic on the CN rail line	Construction	• Transportation and traffic • Work at the railway junction	4 current mitigation measures	Negative	Low	Low	Local	Short	Low	Very low
				Closure	• Decommissioning	2 current mitigation measures	Negative	Low	Low	Local	Short	Low	Very low
		Wildlife harvesting	• Increased dust and noise levels • Disturbance of land users • Safety risk for users • Disturbance of hunting activities for non-aboriginal users	Construction	• All construction activities	3 current mitigation measures	Negative	Low	Low	Limited	Short	High	Low
				Operation	• Rail transport • Maintenance and repair activities	None	Negative	Low	Low	Limited	Long	Low	Very low
				Closure	• Decommissioning	2 current mitigation measures	Negative	Low	Low	Limited	Short	Low	Very low
		Mining and logging	• Loss of 47 ha of productive forest • Increased logging road traffic	Construction	• Clearing • Transportation and traffic	3 current mitigation measures	Negative	Low	Low	Limited	Long	High	Low
				Closure	• Transportation and traffic	2 current mitigation measures	Negative	Low	Low	Limited	Short	Moderate	Very low

Table 8-2: Environmental Impact and Mitigation Measures for the Rail Line Project (Cont'd)

Environ-ment affected	Component affected	Description of the Impact	Phase	Activity	Current and specific mitigation measures[1]	Impact Assessment						Residual Impact
						Nature	Degree of disturbance	Intensity	Extent	Duration	Probability	
Human Environment	Traditional land use	• Loss of 47 ha of forest for the trapline users • Disturbance of users' traditional activities • Migration of some wildlife species • Additional wildlife harvesting by workers • Safety risk for users • Loss of cultural heritage sites	Construction	• All construction activities	9 current mitigation measures	Negative	Moderate	Moderate	Local	Short	Moderate	Moderate
			Operation	• Rail transportation • Maintenance and repair activities	4 current mitigation measures	Negative	Low	Low	Local	Long	Moderate	Low
			Closure	• Decommissioning	2 current mitigation measures	Negative	Low	Low	Local	Short	Low	Very low
	Population and economy	• Investment in the region • Job creation for local and regional manpower and contractors • Economic stimulus	Construction	• All activities	5 current mitigation measures	Positive	Moderate	Moderate	Regional	Short	High	Moderate
			Operation	• Track maintenance and repair activities	1 current mitigation measures	Positive	Low	Low	Regional	Long	High	Moderate
		• Job losses	Closure	• Rail line closure	None	Negative	Low	Low	Regional	Long	High	Moderate
	Archeology	• Discovery of archeological remains	Construction	• All activities	None	Negative	Low	Low	Limited	Short	Low	Very low
	Landscape	• Unattractive views • Decrease in landscape quality • Modification of the visual field during construction and decommissioning	Construction	• All activities • Presence of construction sites	6 current mitigation measures	Negative	Low	Low	Limited	Long	High	Low
			Operation	• Presence of railway infrastructure	1 current mitigation measures	Negative	Low	Low	Limited	Long	Moderate	Low
			Closure	• Presence of the right-of-way	1 current mitigation measures	Negative	Low	Low	Limited	Long	Moderate	Low

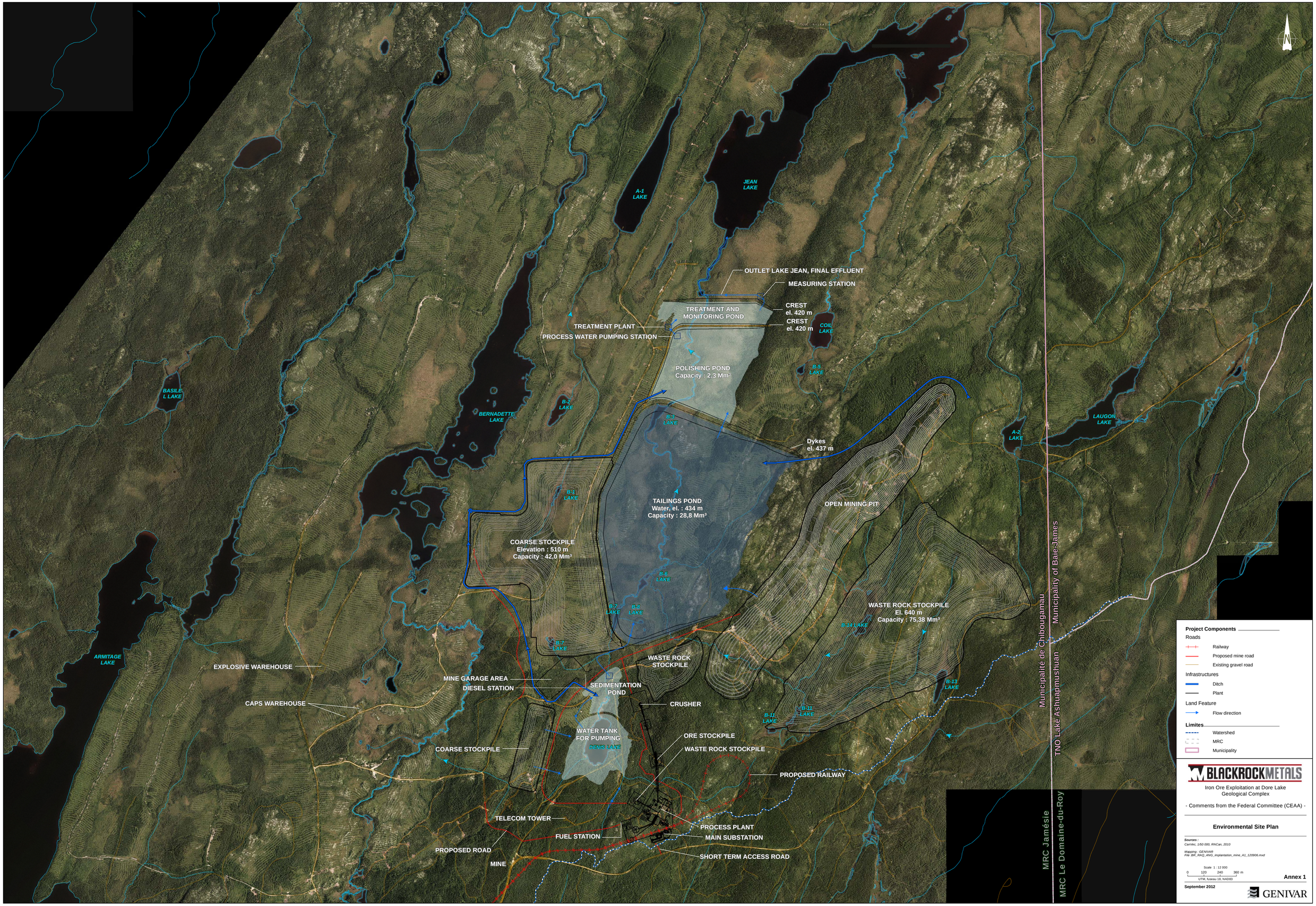
[1]Source: Genivar Inc. (2012). *Project to Build a New Rail Line Segment for the BlackRock Metals Inc. Mining Project – Supplement to the Environmental Impact Assessment Statement*

Table 8-3: Environmental Components Affected by the Project

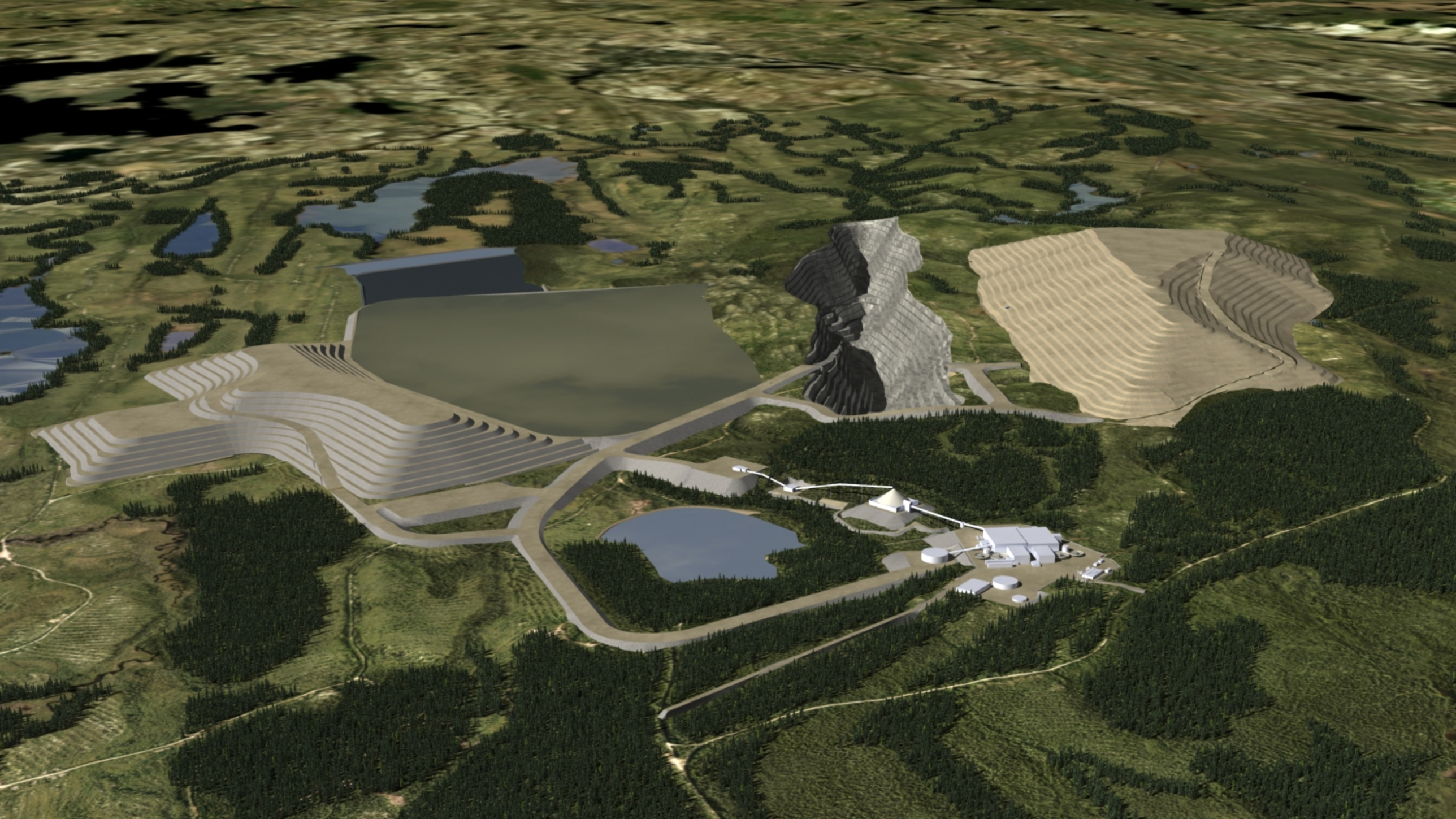
Habitat Type		Areas – Mine Site			Areas – Rail Line		
		Total (ha)	Loss (ha)	Loss (%)	Total (ha)	Loss (ha)	Loss (%)
Forest	Regenerating coniferous forest	9,345.21	579.12	6.19	901.50	18.35	2.04
	Closed mature coniferous forest	3,239.02	248.92	7.69	465.64	9.52	2.04
	Open mature coniferous forest	1,913.69	22.55	1.18	380.16	10.51	2.76
	Unproductive setting	137.23	37.90	27.62	29.14	0.06	0.21
	Mature mixed forest	196.41	37.25	18.97	52.48	0.19	0
	Regenerating mixed forest	2,769.22	31.20	1.13	116.48	5.95	5.11
	Deciduous forest	63.95	8.51	13.31	7.49	0.19	2.54
	Plantation	1,100.21	0.77	0	35.09	2.12	6.04
	Islands	36.48	0	0	0	0	0
	TOTAL	**18,801.41**	**966.23**	**5.14**	**1,987.97**	**46.89**	**2.36**
Wetlands	Marsh	1.88	1.88	100	0	0	0
	Shrubby swamp	46.79	27.93	59.69	32.94	0.72	2.19
	Treed swamp	26.07	3.92	15.04	22.92	0	0
	Disturbed treed swamp	41.79	11.74	28.09	0	0	0
	Treed peatland	164.29	107.27	65.29	389.87	11.44	2.93
	Disturbed treed peatland	0	0	0	87.39	2.03	2.32
	Fen	0	0	0	32.68	0.61	1.87
	Bog	117.39	51.38	43.77	111.48	1.65	1.48
	TOTAL	**398.21**	**204.12**	**51.26**	**677.29**	**16.44**	**2.43**
Drainage network		1,993,07	13.01	0.01	75.42	0.03	0

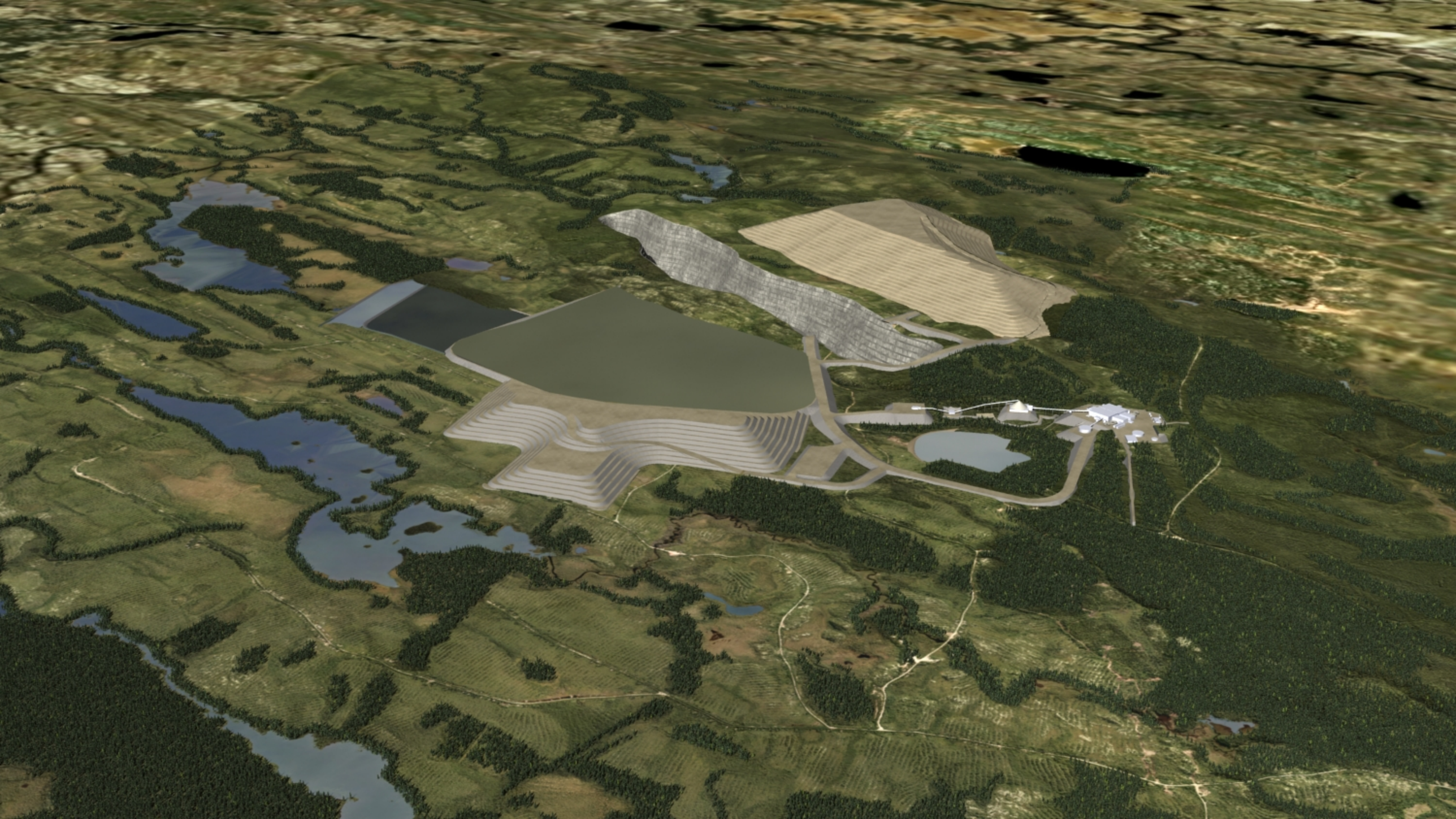
[1] The access road is built and in good repair over 90% of its length. The Lac France section to be built is 3.5 km long with a 10-m wide rolling surface.
[2] The surface area of the pit is the length of the deposit to be mined by 2028 (Phase 1 pit), or 2.8 km, times an estimated average width of 400 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 Lac 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.

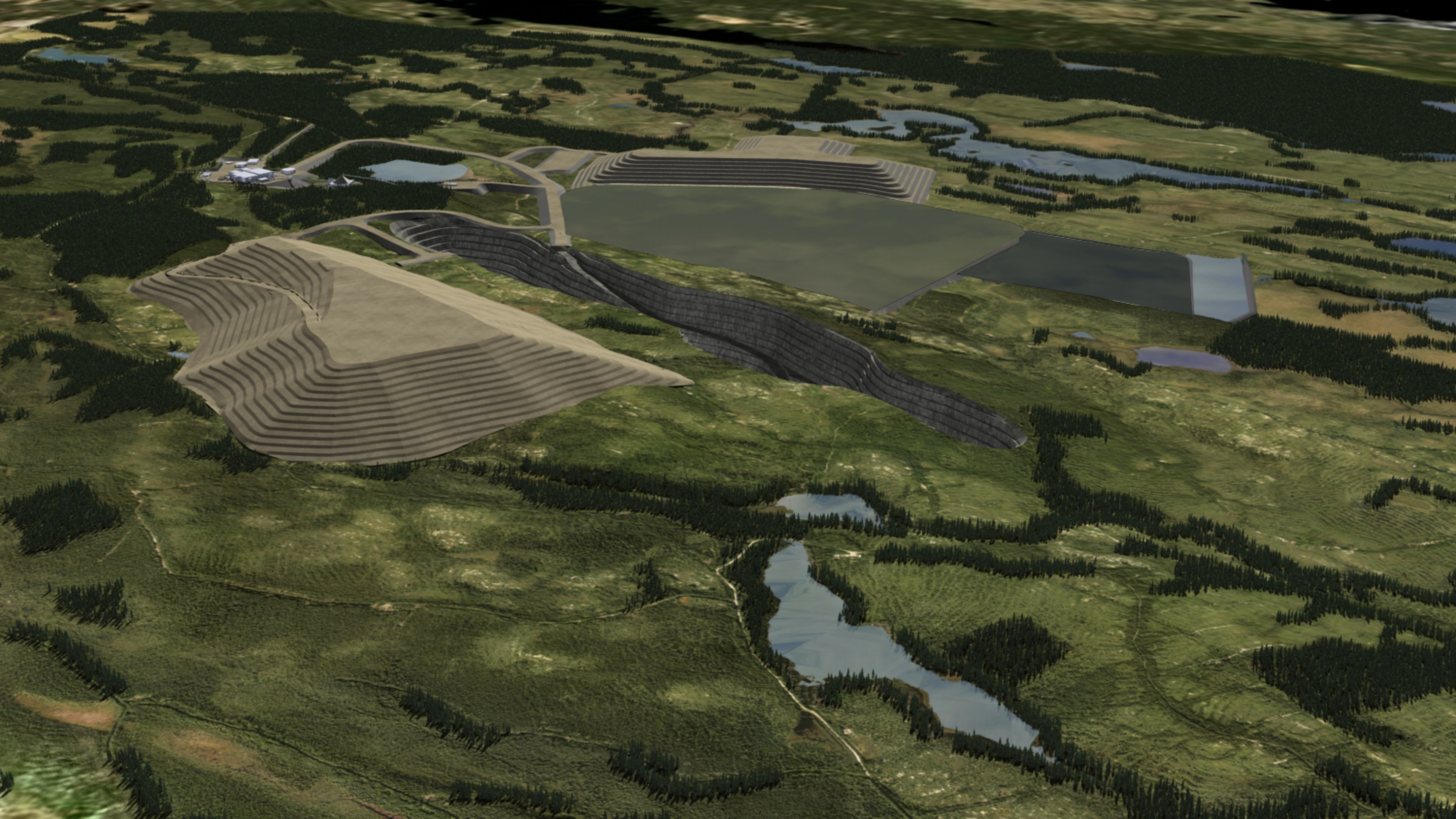
Appendix 1:
Mine Site Layout


A-1 LAKE
JEAN LAKE
OUTLET LAKE JEAN, FINAL EFFLUENT
MEASURING STATION
TREATMENT AND MONITORING POND
CREST el. 420 m
CREST el. 420 m
TREATMENT PLANT
PROCESS WATER PUMPING STATION
COIL LAKE
POLISHING POND Capacity : 2,3 Mm³
B-5 LAKE
BASILE L LAKE
B-2 LAKE
BERNADETTE LAKE
B-3 LAKE
Dykes el. 437 m
A-2 LAKE
LAUGON LAKE
B-1 LAKE
TAILINGS POND Water, el. : 434 m Capacity : 28,8 Mm³
OPEN MINING PIT
COARSE STOCKPILE Elevation : 510 m Capacity : 42,0 Mm³
B-6 LAKE
B-7 LAKE
B-8 LAKE
WASTE ROCK STOCKPILE El. 640 m Capacity : 75,38 Mm³
B-14 LAKE
B-4 LAKE
ARMITAGE LAKE
EXPLOSIVE WAREHOUSE
WASTE ROCK STOCKPILE
MINE GARAGE AREA
DIESEL STATION
SEDIMENTATION POND
B-13 LAKE
CAPS WAREHOUSE
CRUSHER
B-11 LAKE
B-11 LAKE
WATER TANK FOR PUMPING
DENIS LAKE
ORE STOCKPILE
WASTE ROCK STOCKPILE
COARSE STOCKPILE
PROPOSED RAILWAY
TELECOM TOWER
PROCESS PLANT
FUEL STATION
MAIN SUBSTATION
PROPOSED ROAD
SHORT TERM ACCESS ROAD
MINE
Municipality of Baie-James
Municipalité de Chibougamau
TNO Lake Ashuapmushuan
MRC Jamésie
MRC Le Domaine-du-Roy
Project Components
Roads
Railway
Proposed mine road
Existing gravel road
Infrastructures
Ditch
Plant
Land Feature
Flow direction
Limites
Watershed
MRC
Municipality
BLACKROCKMETALS
Iron Ore Exploitation at Dore Lake Geological Complex
- Comments from the Federal Committee (CEAA) -
Environmental Site Plan
Sources :
Canvec, 1/50 000, RNCan, 2010
Mapping : GENIVAR
File: BR_RAQ_ANG_implantation_mine_A1_120906.mxd
Scale 1 : 12 000
0 120 240 360 m
UTM, fuseau 18, NAD83
Annex 1
September 2012
GENIVAR

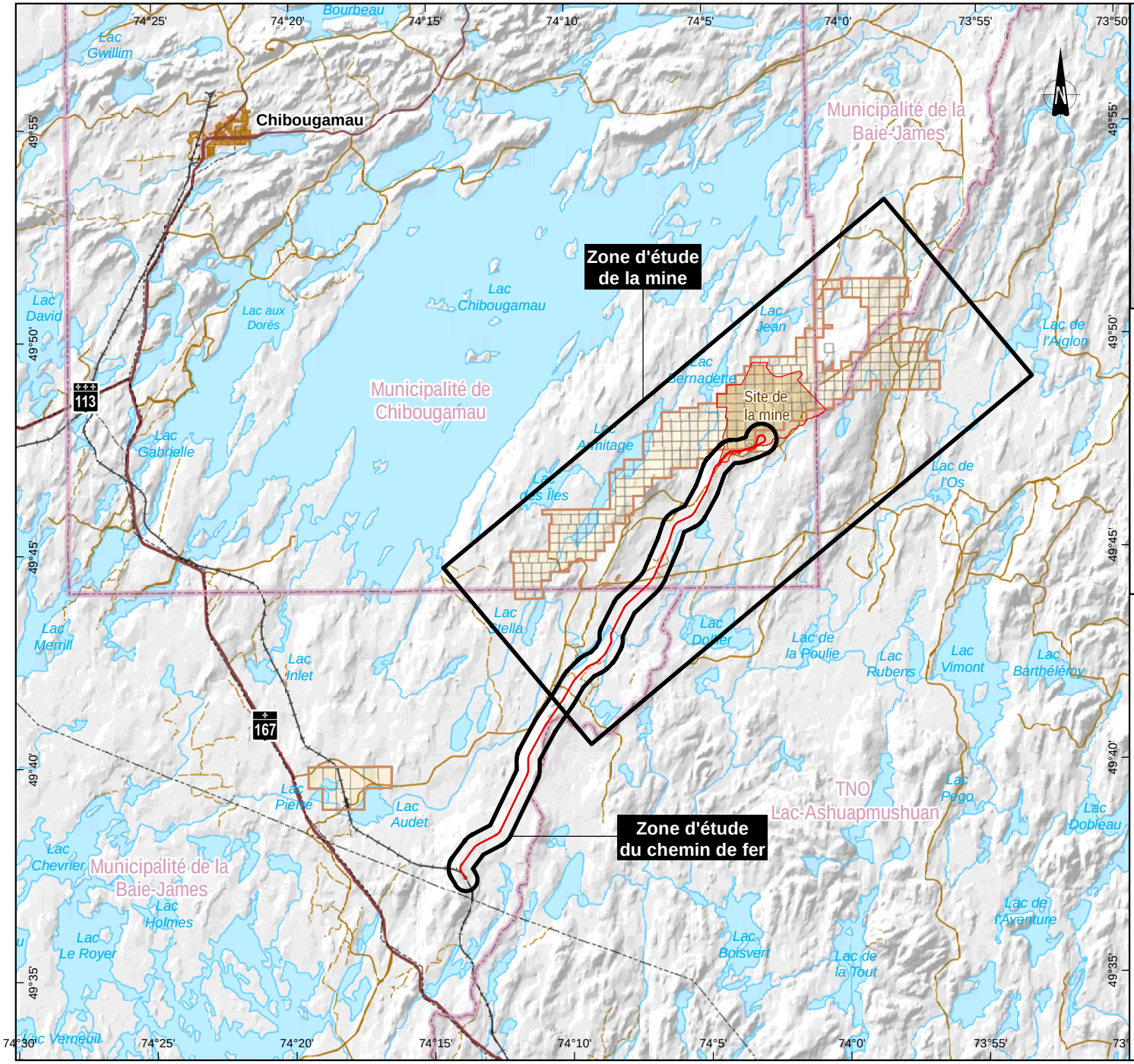
Appendix 2:
Project Simulations

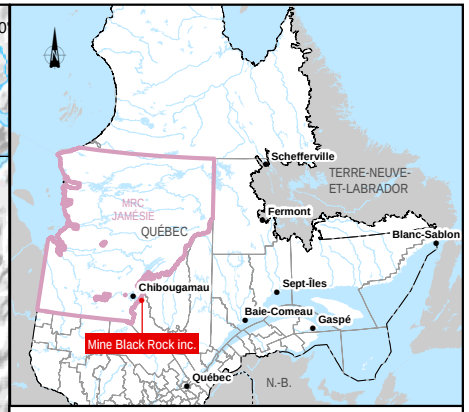






Appendix 3:
Rail Line Corridor





Composantes du projet Métaux BlackRock

- Limite des claims actifs
- Claim minier actif
- Site de la mine
- Chemin de fer proposé

MÉTAUXBLACKROCK

Exploitation du gisement de fer
au complexe géologique du lac Doré

- Réponses aux questions
et commentaires du comité fédéral -

Tracé du chemin de fer proposé

Sources :

BDGA, 1/1 000 000, MRN Québec, 2002
SDA, 1 : 20 000, MRNF Québec, mai 2010

Données de projet: S06428A-GR-CR-17.DWG, CIMA, 14 août 2012

Cartographie : GENIVAR
Fichier : BR_RAQ_C1_zone_Etude_120904.mxd

Échelle 1 : 250 000

0 2.5 5 km

UTM, fuseau 18, NAD83

Septembre 2012

GENIVAR

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