8 CUMULATIVE EFFECTS ASSESSMENT

The air quality data discussed in this chapter derives from the data presented in the federal report (Volume 2 Supporting Study E). A unique subsection (7.3.2.2.2) is provided which presents the Air Quality results in compliance with the EPR guidelines.

8.1 VC SELECTION

The following VCs were identified for the cumulative effects assessment:

The selection criteria, spatial and temporal boundaries and indicators for each VC are listed in Table 8-1. Cumulative effects are described in the respective subsections below.

Table 8-1 Selection Criteria, Spatial and Temporal Boundaries and Indicators

HOWSE VCS ASSESSED UNDER THE CUMULATIVE EFFECTS ASSESSMENT	
Air Quality	
Selection criteria	Importance for First Nations Standard provincial and federal regulatory requirement for this type of project
Spatial boundaries	520 km^2 surrounding the project
Temporal boundaries	Howse Project life (2016-2032)
Indicators	Ambient Air Quality Concentrations for criteria and non-criteria air pollutants
Water and Aquatic Fauna	
Selection criteria	Importance for First Nations (health and fishing activities); Several DSO and Taconite mining projects are concentrated in the Schefferville region, increasing the probability of cumulative effects on fish habitat and water quality.
Spatial boundaries	Howells River watershed
Temporal boundaries	1954-2024
Indicators	Water quality criteria, fish populations
Wetlands	
Selection criteria	Sensitive habitat
Spatial boundaries	Howells River watershed
Temporal boundaries	1954-2024
Indicators	Habitat integrity
Caribou	
Selection criteria	Species of cultural importance for First Nations; At-risk species; Moderate effect of the project on migratory tundra caribou; Migrating species with a wide range, likely to cross several large-project RSAs.
Spatial boundaries	Entire herd ranges
Temporal boundaries	1950s – 2024
Indicators	Individual presence/absence

Avifauna	
Selection criteria	88 species are protected by the Migratory Bird Convention or the *Species at Risk Act;* Breeding ranges of most of the bird species found in the Howse LSA also fell within the RSAs of select projects.
Spatial boundaries	RSA (30-km radius around the Howse Project)
Temporal boundaries	2016-2024
Indicators	Pairs of birds
Human Health	
Selection criteria	Importance for First Nations (health and fishing activities); Federal CEAA Guidance
Spatial boundaries	520 km2 surrounding the project (in alignment with Air Quality RSA)
Temporal boundaries	Howse Project life (2016-2032) (in alignment with Air Quality RSA)
Indicators	Chemistry (Soil, berries/vegetation, game meat, fish, air); exposure rates; hazard quotients (based on chronic exposure limits), incremental lifetime cancer risk.
Subsistence and Traditional Activities of Aboriginal Groups	
Selection criteria	Importance for Aboriginal groups (Chapter 4); Concerns regarding potential effects on harvested resources and access to land
Spatial boundaries	30-km radius around the Howse Project
Temporal boundaries	1954-2024
Indicators	Increased costs for subsistence activities; impaired access to land; absence of quality resources in the RSA
Health and Socioeconomic Conditions of Aboriginal Peoples	
Selection criteria	Importance for Aboriginal groups; Concerns regarding the potential effects on human health; Positive effects of economic benefits; Concerns regarding the maximization of economic benefits.
Spatial boundaries	30-km radius around the Howse Project
Temporal boundaries	1954-2024
Indicators	A sense that the health of the population is being safeguarded by mining companies; maintain socioeconomic benefits and ensure their maximization for the local populations and Aboriginal groups

8.2 PROJECTS AND ACTIVITIES CONSIDERED FOR THE CUMULATIVE EFFECTS ASSESSMENT

The unprecedented recent drop in iron ore prices has led to many rapid changes to the numerous iron mining projects in western Labrador. This volatile situation resulted in rapid changes to the scope of the activities and makes it difficult to confirm the current and future activities which should be included in the cumulative effects assessment. As such, several projects described below are under a temporary stoppage, with an uncertain future. In an effort to establish a realistic a baseline from which to conduct the cumulative effects assessment, we consider here all anticipated activities, even those that are currently uncertain. In this manner, we consider the worse-case scenario for the cumulative effects assessment for the Howse Project valued components.

This section presents an overview of probable projects that are located in the vicinity of the Howse Project and/or share infrastructure with the Project

8.2.1 Schefferville Area

DSO Projects – TSMC and Past IOCC Operations

Aside from Howse, other DSO projects are currently active or are planned for the near future (Table 8-2 and Figure 8-1). The site was mined by the IOCC up until 1982, and hosts 10 deposits mined by open pit (Figure 8-2). Ore is trucked to a plant for crushing, screening and washing to produce lump ore and sinter fine ores. From the plant, the ore is transported via rail to Sept-Îles, Québec, for shipment to customers. To the extent possible, the Project will use existing infrastructure or renovate/re-build infrastructure abandoned or decommissioned by other mining companies. A new multi-user deep-sea port located in Pointe-Noire was built in 2014 to accommodate the iron ore shipping needs of TSMC/LIM and other users.

Taconite – New Millenium Iron - Currently on hold.

The Taconite project consists of two deposits: the LabMag deposit located in the province of Newfoundland and Labrador and the KéMag deposit located in the province of Québec (NML, 2015). The concentrate will be transported from the mine to Sept-Îles via a ferroduct. In March 2011, NML and TSMC signed a binding heads-of-agreement regarding project development. TSMC has an option to develop one or both properties. If TSMC decides to develop only one deposit, NML will be free to develop the other deposit on its own or with some other partner. The parties jointly undertook a feasibility study that was completed in early 2014.

Recently, NML announced a new strategy to develop properties called NEWTAC.

Block 103 – Cap-Ex

Block 103 covers an area of 73 km^2 located 30 km northwest of the mining Town of Schefferville, Québec (Cap-Ex Iron Ore Ltd., 2014). The preliminary economic assessment was released in June 2013.

Joyce Lake – Century Iron Mines

The Attikamagen property, which includes both Joyce Lake and Hayot Lake, is located approximately 20 km northeast of Schefferville (Century Iron Mines, 2014). An EIS and a bankable feasibility study are underway, and production is expected to start in 2017. Labec Century Iron Ore Inc., a subsidiary of Century, has a 100% registered interest in the Attikamagen property. Century has signed a joint venture agreement with WISCO pursuant to which WISCO has earned 40% joint venture interest in Century's interest in the Attikamagen property.

Lac Otelnuk – Adriana Resources Inc.

The Lac Otelnuk iron project is located 170 km north of the Town of Schefferville, Québec (Adriana Resources Inc., 2015). The property was first explored in the early 1950s, when a significant magnetite iron formation was mapped over a strike length of approximately 25 km. Subsequent diamond drilling and surface sampling in the 1970s, which was largely limited to the upper iron formation unit, resulted in historic mineral resource estimates for two adjacent zones, the North and South zones. The results of the 2010 drill program confirmed a large, flat-lying iron formation covering an approximate area of 22.5 km^2.

Menihek Generating Station

The dam and powerhouse are located in Newfoundland and Labrador, 40 km south of Schefferville, Québec (Nalcor Energy, 2014). Nalcor took over ownership of the 18.7 MW Menihek generating station from the

IOCC in 2007. The company has entered into a 40-year power purchase agreement with Hydro-Québec to supply electricity from this facility to Hydro-Québec for its customers in the Schefferville region.

Tshiuetin Rail Transportation Inc.

Tshiuetin Rail Transportation Inc. owns 213 km of railway connecting Emeril (Labrador) and Schefferville (TSH, 2009). The owners are the three following First Nations:

- Innu Takuaikan Uashat mak Mani-Utenam
- Naskapi Nation of Kawawachikamach
- IN of Matimekush–Lac John

The company began its operations on December 1, 2005, and presently employs 40 people.

8.2.2 Labrador West and Fermont Area

QNS&L

QNS&L railway is a federally regulated common carrier operating freight services between Sept-Îles, Labrador City and Emeril Junction, which is the interconnection point for traffic transiting to and from Schefferville with the connecting carrier, Tshiuetin Rail Transportation (QNS&L, 2015). QNS&L is a wholly-owned subsidiary of IOCC. QNS&L offers bulk, through-freight and way-freight type rail services on its line.

Labrador Operations – IOCC

The IOCC mined iron ore in the Schefferville area from 1954 to 1982. The IOCC has been operating the Carol project in Labrador City since the 1960s (IOCC, 2013). The Labrador City operation produces concentrated iron ore and pellets (further processed), and transports these by train to the Port of Sept-Îles on the Gulf of St. Lawrence, and from there to global customers.

This project currently consists of:

- four operating open pit mines (Humphrey Main, Humphrey South, Sherwood Pond and Luce);
- two dormant pits (Lorraine and Spooks);
- one mined-out pit (Smallwood); and
- two new deposits (Wabush 3 (**currently on hold**) and Wabush 6), which are in the planning stages for future development.

Mont Wright Mine – ArcelorMittal

The Mont Wright open pit mine lies 16 km southwest of Fermont, covers an area of over 24 km^2, and has reserves and resources of one billion tonnes of crude ore with an iron content of approximately 30% (ArcelorMittal, 2014a). The concentrate is processed through filter tables to remove the water, and routed to the loading silo to be put on trains bound for Port-Cartier via the Cartier railway/ArcelorMittal Mines Canada railway.

Fire Lake – ArcelorMittal

The open pit mine at Fire Lake is located 55 km south of the Mont-Wright mining complex (ArcelorMittal, 2014b). The mine operates solely between May and October, when the ground is thawed. Products are sent to Port-Cartier via the Cartier railway/ArcelorMittal Mines Canada railway.

Fire Lake North – Champion Iron Mines Limited

The Consolidated Fire Lake North (CFLN) property is located in eastern Québec, immediately north of ArcelorMittal's Fire Lake Mine and 60 km south of Cliffs Natural Resources' Bloom Lake mine (Champion Iron Mines Limited, 2014).

Lac Knife – Focus Graphite

Focus Graphite Inc. own 100% of the Lac Knife crystalline flake graphite deposit, located in the Côte Nord region of Québec (Focus Graphite, 2015). Situated in the Grenville geological province of northeastern Québec about 27 km south of Fermont, the company's flagship property consists of a total of 57 mineral claims covering 299 km^2. At approximately 15% graphitic carbon, Lac Knife is one of the highest-grade flake graphite deposits in the world. The project is located between the Cartier railway/ArcelorMittal Mines Canada railway and the QNS&L railway.

Wabush, Scully and Bloom Lake Mines

Soon after IOCC started operations in the Wabush area near Labrador City, Wabush Mines opened its own workings in the same area. In 1963, it opened the Wabush Railway, a short railway connecting the mine workings with the QNS&L railway. Under an agreement with IOCC, QNS&L would carry Wabush Mines ore to the port of Sept-Îles. In December 2015, Wabush Mines ceased operations.

Cliffs Natural Resources announced the definitive closure of its Scully mines near Wabush in October 2014 and closed the Bloom Lake mine in January 2015 (Cliffs Natural Resources, 2015).

Kami – Alderon Iron Ore Corp

The Kami property is strategically located next to the mining towns of Wabush, Labrador City and Fermont (Alderon Iron Ore Corp, 2014). The property includes 305 claims in Labrador for a total of 76 km^2. Kami is within close proximity to a road (~2.5 km), a common railway carrier (~15 km) and a hydro power station (~15.5 km). The QNS&L railway will transport the material to the new deep sea port constructed in 2014 that will provide year-round access to the global market. Alderon has secured port access to ship up to 8 million tonnes of iron ore annually via the Pointe-Noire multi-user port.

Roy's Knob – Shabogamo Mining

Quartzite mining at Roy's Knob, with estimated reserves of 5-6 million tonnes, commenced in October 1999 (Labrador West, 2014). Quartzite is washed and screened at a plant in Wabush and shipped by rail to Sept Îles, Québec.

Champion Railway

In October 2014, Champion, the Government of Québec and Lac Otelnuk Mining Ltd. (a joint venture between Adriana Resources and WISCO International Resources Development & Investment Limited) announced a government-industry partnership to advance the feasibility study for a new rail line in the Labrador Trough. The partnership is called "La Société ferroviaire du Nord québécois" (SFNQ). All mining companies are free to become SFNQ partners.

8.2.3 Infrastructure and Other Projects at the Port of Sept-Îles

Some activities currently taking place in the Sept-Îles area need to be considered in addition to the Howse Project's train unloading/boat loading activities. In this context, a new multi-user deep sea port was constructed in 2014 at Pointe-Noire. Current major activities include the Arnaud railway, the ArcelorMittal pelletizing plant and the Alouette aluminium smelter. The Arnaud mining project, an apatite mine, should be developed in 2016-2018.

Table 8-2 Projects/Activities Considered in the Cumulative Effects Assessment

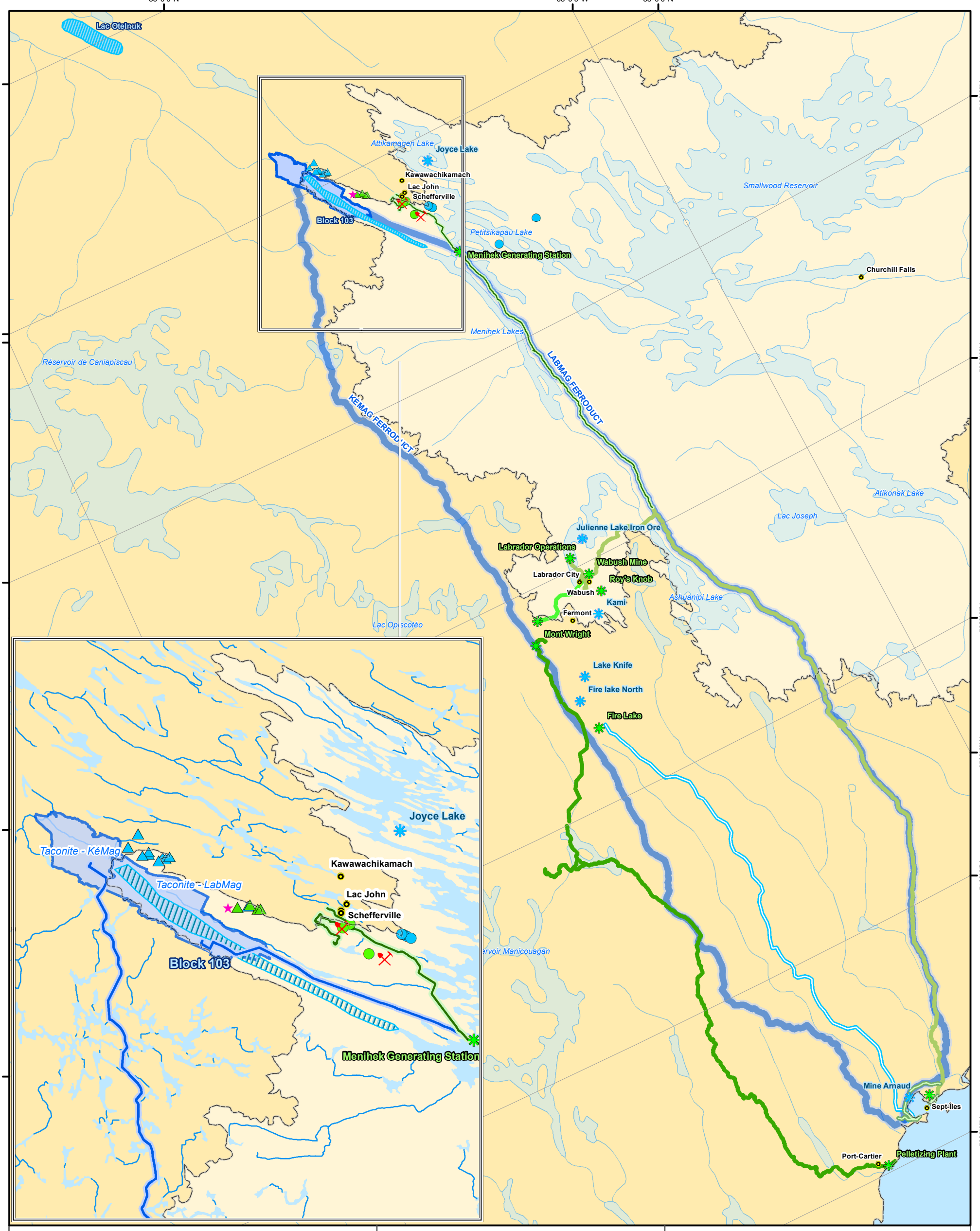
PROJECT / ACTIVITIES	OWNER	LOCATION	DURATION / SCHEDULE	ANTICIPATED SOURCES OF EFFECT*	INTERACTION WITH THE HOWSE PROJECT
Past Activities					
Labrador Operations – Schefferville Area	IOC	Schefferville area	1954-1982	Soil contamination by abandoned tailings; strongly anthropogenically disturbed landscape; unsecured old pits (no systematic fencing), erosion …	Possible cumulative effects with the Howse mine components
Existing Projects					
DSO 3 (Project 1a or ELAIOM)	TSMC	Schefferville area	The plant will run for the next 20 years and schedule could change	Emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse mine components
Schefferville Area Stage 1 project	LIM (Currently under bankruptcy protection)	Schefferville area	James mine in operation since 2011 – suspended operation since 2014 LIM operations are on hold until future notice	Emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	None
Menihek Generating Station	Nalcor	Schefferville area	In operation	Employment, contracting opportunities	Possible cumulative effects with the Howse mine components
Tshiuetin Rail Transportation	ITUM, NIMLJ, NNK	Schefferville – Emeril Junction	In operation since 2005 (was in operation prior under QNS&L)	Rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
QNS&L	IOCC	Emeril Junction – Sept-Îles	In operation	Rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Wabush Mine		Labrador West and Fermont area	Not in operation	QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles

PROJECT / ACTIVITIES	OWNER	LOCATION	DURATION / SCHEDULE	ANTICIPATED SOURCES OF EFFECT*	INTERACTION WITH THE HOWSE PROJECT
Roy's Knob	Shabogamo Mining	Labrador West and Fermont area	In operation since 1999	QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Labrador Operations – Humphrey Main, Humphrey South, Sherwood Pond and Luce	IOCC	Labrador West and Fermont area	In operation	QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Mont Wright	ArcelorMittal	Labrador West and Fermont area	In operation	Cartier rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Fire Lake	ArcelorMittal	Labrador West and Fermont area	In operation	QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Arnaud Railway	Arnaud Railway Company	Sept-Îles	In operation	Emission of air pollution, dust, noise, vibration and light, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles harbor
Pelletizing Plant	ArcelorMittal	Port-Cartier	In operation	Emission of air pollution, dust, noise, vibration and light, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles harbor
Aluminium Smelter	Alouette	Sept-Îles	In operation since 1992	Emission of air pollution, dust, noise, vibration and light, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles harbor
Future Projects					
DSO 4 (Project 2a)	TSMC	Schefferville area	In production from 2018 to 2024	Stripping of vegetation, emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse mine components
DSO 4 (Project 2b)	TSMC	Schefferville area	In production from 2015 to 2020	Stripping of vegetation, emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse mine components

PROJECT / ACTIVITIES	OWNER	LOCATION	DURATION / SCHEDULE	ANTICIPATED SOURCES OF EFFECT*	INTERACTION WITH THE HOWSE PROJECT
Block 103 covers an area of 73 km^2 30 km northwest of Schefferville, Québec (Cap-Ex Iron Ore Ltd., 2014). The preliminary economic assessment was released in June 2013.	Cap-Ex Iron Ore Ltd.	Schefferville area	Production targeted for 2018	Stripping of vegetation, emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse mine components
Schefferville Area Stage 2 and Stage 4 & 5 projects	LIM (Currently under bankruptcy protection)	Schefferville area	LIM operations are on hold until future notice	Stripping of vegetation, emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	
Joyce Lake	Century Iron Mines / WISCO	Schefferville area	In EIS process, production planned for 2017	Stripping of vegetation, emission of air pollution, dust, noise, vibration and light, pits, waste rock piles, QNS&L and Tshiuetin rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse mine components
Lac Otelnuk	Adriana Resources Inc.	North of the Schefferville area	Feasibility stage	Construction of new railway – Champion rail traffic; stripping of vegetation, habitat fragmentation, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Labrador Operations – Wabush 3 and 6	IOCC	Labrador West and Fermont area	EIS submitted in 2014	QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Lac Knife	Focus Graphite	Labrador West and Fermont area	In EIS process	Cartier or QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Kami	Alderon Iron Ore Corp	Labrador West and Fermont area	In EIS process	QNS&L rail traffic, Pointe-Noire multi-user port unloading activities, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles

PROJECT / ACTIVITIES	OWNER	LOCATION	DURATION / SCHEDULE	ANTICIPATED SOURCES OF EFFECT*	INTERACTION WITH THE HOWSE PROJECT
Fire Lake North	Champion Iron Mine Limited	Labrador West and Fermont area	Preliminary feasibility study published in 2013	Construction of new railway – Champion rail traffic: stripping of vegetation, habitat fragmentation, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Julienne Lake	Altius Minerals/JL Alliance	Labrador West and Fermont area	Final stage negotiations with NL government for award of mineral rights	QNS&L rail traffic, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles
Arnaud Mining Project	Investissement Québec and Yara International ASA	Sept-Îles	Construction 2016-2018	Stripping of vegetation, emission of air pollution, dust, noise, vibration and light, employment, employment, contracting opportunities	Possible cumulative effects with the Howse iron ore transportation to Sept-Îles harbor

*In the vicinity of the Howse Mine Project infrastructure, including the shared QNS&L railway line and Sept-Îles multi-user dock.



LEGEND

Mining Projects

Past Project/Activity

- Labrador Operations - Schefferville Area

Existing Project/Activities

- Shefferville Iron Ore Mine Stage 1
- DSO 3 - Project 1a (ELAIOM)
- Other Project
- Arnaud Railway
- Bloom Lake Rail Spur
- Cartier Railway
- QNS&L
- Tshiuetin Rail Transportation

Future Project

- Shefferville Iron Ore Mine Stage 2, 4, 5
- DSO 4 - project 2a, 2b
- Other Project
- Champion Railway
- Other Future Project
- Taconite - KéMag/LabMag
- KéMag/LabMag Ferroduct

Basemap

- Town
- Howse Deposit
- Watercourse
- Water Body
- Provincial Boundary

FILE, PROJECT, DATE, AUTHOR:
GH-0608 , PR185-19-14, 2016-03-23, edickoum

N

0 50 100
Kilometers

UTM 19N NAD 83

SCALE: 1:1 800 000

SOURCES:
Basemap
Atlas of North America, 1:7,500,000
Government of Quebec, BDGA, 1:1,000,000

ENVIRONMENTAL IMPACT ASSESSMENT
HOWSE PROPERTY PROJECT

Other Projects Considered for Cumulative Effects Assessment

Howse Minerals Limited

GroupeHemispheres
5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 8-1

LEGEND

Infrastructure and Mining Components

- Proposed Howse Pit
- Proposed Topsoil/ Overburden Stockpile
- Proposed Site Infrastructure
- Proposed Waste Dump/ In-Pit Dump
- Proposed and Existing Sedimentation Pond
- DSO Haul Road
- Existing Railroad
- Existing Pit
- Proposed Mine Haul Road

Basemap

- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Disappearing Stream
- Artesian Spring
- Water Body
- Provincial Border
- Existing Road
- Main Access Road
- Wetland

*Hydronyms are oriented along the direction of water flow

FILE, PROJECT, DATE, AUTHOR:
GH-0613 , PR185-19-14, 2016-03-23, edickoum

0 1 2 3 4
Kilomètres

UTM 19N NAD 83 SCALE: 1:65 000

SOURCES:
Basemap
Government of Canada, NTDB, 1:50,000, 1979
Government of NL and Government of Quebec, Boundary used for claims
Groupe Hémisphères, Hydrology, 2013.

Infrastructure and Mining Components
New Millennium Capital Corp., Mining sites and roads
Howsel Minerals Limited/ MET-CHEM,
Howse Deposit Design for General Layout, 2015

ENVIRONNEMENTAL IMPACT ASSESSMENT
HOWSE PROPERTY PROJECT

Old and Active Pits in the Howse Project Area

Howse Minerals Limited

GroupeHemispheres
5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 8-2

8.3 AIR QUALITY CUMULATIVE EFFECTS ASSESSMENT

8.3.1 Scoping

The effects of air emissions from the Howse Project and nearby projects (e.g. DSO3 and DSO4) on air quality are considered in this cumulative effect assessment. The study area considered for cumulative assessment encompasses sensitive receptors of interest in the RSA and mining / processing/ hauling activities associated with Howse, DSO3 and DSO4 located within the LSA. The air dispersion modelling report (Volume 2 Supporting Study E) provides explanations on how air emissions sources from the three projects were incorporated in the calculations. The Howse, DSO3 and DSO4 projects are interconnected and their operation schedules will coincide at one point. This interconnection necessitated a global approach to the air modelling study. Analysis

Table 7-14 and Table 7-16 summarize the air modelling results for each area of the global projects e.g. DSO3/DSO4 only, Howse only and, All (DSO3/DSO4 + Howse + background). In reviewing these three tables together with the frequency of exceedances in Table 7-17 and Table 7-18, the following analysis can be made:

- For annual averages, the project's ambient air quality assessment criteria are all met. The contribution of the Howse Project to the overall predicted ambient air concentrations is generally less than 20% of the total.
- For daily averages (24-hr), under the "No Blasts" modelling scenario, the cumulative maximum predicted concentrations exceed the Project's ambient air quality assessment criteria at sensitive receptor R40 (Workers' camp) less than 0.82% of the time (see Table 7-17) shows the modelling result from DSO3/DSO4 projects only is 283.3 $\mu g/m^3$ at R40, which demonstrates they are the principal contributors to the exceedances at this receptor. The Howse Project does have an effect at R40, but the modelling result for Howse only is 43.2 $\mu g/m^3$ at R40 which in itself is less than the 200 $\mu g/m^3$ assessment criteria (see Table 7-15).
- For daily averages (24-hr), under the "No Blasts" modelling scenario, the maximum predicted concentrations for the Howse Project in itself do not exceed the Project's ambient air quality assessment criteria. Under the "With Blasts" modelling scenario for PM_{10} 24-hr, the cumulative effect at sensitive receptor R13 (Naskapi – Uashat people's camp) is 57.5 $\mu g/m^3$ vs a criteria of 50 $\mu g/m^3$. The Howse Project contributes the majority of this effect with 36.1 $\mu g/m^3$ because receptor R13 is located close to the Howse deposit. However, as shown in Table 7-17, this exceedance is predicted to occur only once in 5 years.
- For short-term averaging periods (24-hr, 8-hr, 3-hr, 1-hr), under the "No Blasts" modelling scenario, the maximum predicted concentration for the Howse Project in itself do not exceed the project's ambient air quality assessment criteria. Under the "With Blasts" modelling scenario, exceedances are predicted at nine sensitive receptors. The Howse Project is the main contributor at seven of these nine receptors, the exceptions being R18 (Inukshuk Lake) and R40 (Workers' camp). As can be seen in Table 7-17, the frequency of exceedances at all these sensitive receptors is less than 1%.
- For the "With Blasts" scenario results, exceedances are predicted for the following averaging periods and pollutants: 24-hr (TPM, PM_{10}, $PM_{2.5}$, and NO2), 1-hr (NO_2, SO_2, CO). The maximum number of predicted exceedances is 2.85% of the time for PM_{10} (24-hr) at "Off-Property Limit" grid receptor UTM coordinate 625.6801, 6083.313 in QC. Figure 3.16 of the Air Dispersion Modelling Report shows the points at which maximum concentrations are predicted to occur; these points are located on the edge of the air quality modelling perimeter. The cause of the predicted exceedances is: the DSO3 Fleming 7N pit is located in close proximity to the Québec border and the air quality modelling perimeter. Combining this short distance and the conservativeness of blasting events by the air model, leads to exceedances predictions.

8.3.2 Mitigation

Since the other projects considered in the air quality cumulative effects assessment are under TSMC's control, the previously-mentioned standard and specific mitigation measures for air quality will be applied by TSMC. In addition, proponent will practice adaptive management of the air quality in the vicinity of the Howse Project and in DSO areas as a whole. Adaptive management will be based on the air quality monitoring plan (AQMP) currently under review by the NL, QC and Kativik authorities (see below under Follow up and Monitoring Programs).

8.3.3 Residual Effects Significance Assessment

The project's air quality assessment criteria are based on air quality standards promulgated by environmental authorities. These air quality standards were developed to protect human health. From an ecological perspective, short-term exceedances of air quality assessment criteria as identified in this EIS have limited effect. After completion of the project, major active sources of air emissions (ore mining, transport and processing) will stop. Inactive sources of air emissions (piles) may continue to be affected by wind erosion. Table 8-3 presents assessment criteria applicable specifically to air quality.

Table 8-3 Assessment Criteria Applicable for the cumulative effects on Air Quality

TIMING		
Inconsequential timing	**Moderate timing**	**Unfavorable timing**
Timing of predicted Howse and surrounding projects air emissions has no consequences on air quality	Timing of predicted Howse and surrounding projects air emissions may have consequences on air quality	Timing of predicted Howse and surrounding projects air emissions has consequences on air quality
SPATIAL EXTENT		
Site specific	**Local**	**Regional**
Effects are limited to the footprint of the project.	Effects extend beyond the footprint, but do not extend outside the LSA.	Effects will affect air quality in substantial part or the entire RSA.
DURATION		
Short	**Medium**	**Long**
>1 hour Air quality standards for 1-hour periods are applicable. Effects of blasts are modelled as one hour events.	>24 hours Air quality standards for 24-hour periods are applicable. Maximum activities can occur on a continuous basis over several periods of 24 hours	>1 year Air quality standards for 1-year periods are applicable. Project activities will be conducted at varying intensities all year long
REVERSIBILITY		
Reversible	**Partially reversible**	**Not reversible**
Air quality returns to pre-project levels	Air quality degradation persist after source of effect ceases, but its magnitude is significantly lower	Air quality degradation persist after source of effect ceases
MAGNITUDE		
Low	**Moderate**	**High**
Air quality at sensitive receptors within the RSA is barely or not affected by the Howse and surrounding projects (all parameters meet Project's air quality assessment criteria)	Air quality at sensitive receptors in the RSA is moderately affected by the Howse and surrounding projects because air modelling results do not meet the Project's air quality assessment criteria.	Air quality at sensitive receptors in the RSA is severely affected by the Howse and surrounding projects because air modelling results persistently do not meet the Project's air quality assessment criteria.

FREQUENCY		
Once	**Intermittent**	**Continual**
Air quality standards will be exceeded once	Air quality standards will be exceeded occasionally, such as during blasting events.	Air quality standards will be exceeded year round.

Timing

Howse Project and surrounding projects activities will occur throughout the year. The air dispersion modelling study included hourly meteorological conditions over a 5 year period. Maximum predicted results for several pollutants were compared were compared to project specific assessment criteria, regardless of season and timing. Logically, dust emissions from the project are expected to be higher and more visible during the summer. Additionally, withstanding modelling limitations, blasting events at the Howse and DSO3 pits are predicted to create short-term air quality exceedances, and so the effect is high (Value of 3).

Spatial extent

The air dispersion modelling study predicts that short-term air quality assessment criteria may be exceeded at certain sensitive receptors and at geographical grid receptors mostly due to the methodology used to input blasting events in the air modelling software. These short-term exceedances are limited to the LSA. No exceedances of air quality assessment criteria are predicted outside the LSA. As such, the spatial effect of the projects in the RSA (Howse, DSO3 and DSO4) is predicted to extend beyond the footprint, but does not extend outside the LSA (Value of 2).

Duration

Air quality will be negatively impacted from the beginning of the construction phase of a project up to the end of the projects, and even after. Air emissions will be generated during all phases of the project. The nature of the air pollutants will be similar throughout all phases of a project, but the highest air emissions effects will occur during the Operation phase, due to the intensity of mining, transportation and processing activities. Air modelling results predicted that all long term (e.g. 1-yr averaging period) project air quality assessment criteria are met, but nonetheless the duration of the effect will last throughout the life of the mine. For this reason, the duration is considered to be long (Value of 3).

Reversibility

After the high intensity operation phase stops, air quality will mostly return to pre-project conditions. Airborne dust due to wind erosion from tailing piles may still occur after all projects are stopped, but with the proposed mitigation measures and pit design, if dust from piles becomes airborne, its effect will be limited to the project footprint. As such, the air quality effect of the projects is considered reversible (Value of 1).

Magnitude

When considering the cumulative effects of Howse, DSO3 and DSO4 projects at sensitive receptors, some air quality exceedances are predicted for short-term averaging periods. Exceedances at sensitive receptors are predicted to occur less than 1% of the time under the worse-case modelling scenario "With Blasts". The exceedance frequency falls to less than 0.38% of the time, when the normal modelling scenario "No Blasts" is considered. Finally, under the "With Blasts" modelling scenario, at non-sensitive receptors (e.g. geographical grid receptors) located on or in close proximity to the air quality modelling perimeter, the

model predicts a frequency of exceedances of less than 2.85% for PM_{10} (24-hr). This percentage is less for other pollutants and averaging periods. The exceedance frequency falls to less than 0.82% of the time, when the normal modelling scenario "No Blasts" is considered. As mentioned previously, no humans live at non-sensitive receptors. For these reasons, the magnitude is considered to be moderate (Value of 2).

Frequency

The frequency is intermittent, since even though activities of the Howse Project will occur on a continuous basis for at least 7 months per year and year round for the other projects, exceedances of air quality standards are predicted to occur infrequently. The associated value is 2 (Value of 2).

8.3.3.1 Significance

Combined, the effects from all emission sources of the surrounding projects and Howse on air quality is significant (Value of 14). The primary disturbance caused to air quality at sensitive receptors by the projects is due to blasting events at the pit and the presence of diesel generators for electricity production to be used at the Workers' camp.

Likelihood

The likelihood of Howse having an effect on air quality is high, since air emissions will be generated throughout the duration of the project.

8.3.4 Follow up and Monitoring Programs

An exhaustive air quality monitoring plan (AQMP) is currently under review by the NL, QC and Kativik authorities. The AQMP will consist in the installation of a network of air monitoring equipment at several locations for several air pollutants such as: NOx, TPM, $PM_{2.5}$, metals and dustfall. A draft version of the AQMP is provided in Volume 1 Appendix XXIV.

8.4 WATER AND AQUATIC FAUNA CUMULATIVE EFFECTS ASSESSMENT

8.4.1 Scoping

Hydrology and hydrography, water quality and aquatic fauna cumulative effects are intertwined and will be assessed together in this section.

The cumulative anthropogenic disturbances considered here lie within the RSA or the Howells River watershed upstream of the mouth of Elross Creek (~800 km^2). Near the Howse Project mine area, past IOCC mining activities have cause considerable changes to the local hydrography, potentially causing fish habitat loss or alteration and water quality degradation downstream (namely in Elross Creek). Other ongoing DSO mining activities (TSMC and LIM) contribute to water quality degradation and fish habitat loss. The Taconite project, which may vary in scale depending on the option selected (Labmag and KéMag deposits), and Block 103 will also potentially result in fish habitat loss and water quality degradation in the Howells River watershed.

8.4.2 Analysis

Water quantity changes are expected to be small and limited to the Howells river watershed. Therefore, no cumulative water budget changes are expected at the Howells River watershed scale. The same reasoning applies to water quality at the Howells River watershed scale.

At a smaller scale (Elross, Burnetta and Goodream creeks), some changes to the water budget are expected from the Howse Project, namely: a 4% reduction in area of the Pinette Lake watershed, a 9% increase in

the area of the Goodream Creek watershed at the junction with HOWSEB, and a 72% increase in area of the Burnetta Creek watershed at the junction with HOWSEA. The only other projects impacting on those watersheds are past IOCC and DSO3 projects. As far as Burnetta Creek is concerned, none of those other project had an effect on its water budget or water quality and there is therefore there is no cumulative effect to consider in that watershed.

For the Goodream Creek watershed, the only accumulation of effects would come from Timmins 4 pit exploitation (DSO3 Project), but the impact of that activity only lasted a short while and is already completed with no detectable adverse environmental effect (only a few day of discharging essentially limited to surface mine drainage). Therefore, the predicted water budget effects will not be cumulative in Goodream Creek and will come solely from the Howse Project.

Concerning Elross Creek, the 4% reduction of the Pinette Lake watershed was evaluated as negligible to the water budget of Elross Creek watershed in section 7.3.9 and past IOCC and DSO3 projects are only redirecting surface drainage from the same watershed, therefore, no cumulative effect on water budget are expected in that watershed either.

As for water quality, sampling following the Timmins 4 pit termination does not suggest any contamination of Goodream Creek. Indeed, water quality, according to basic chemistry (pH, conductivity, dissolved oxygen and turbidity), does not show any substantial change after the discharge as shown by data from 2013 and 2014 Real Time Water Quality annual deployment reports (NLDEC, 2013b and 2014d). Therefore, no cumulative effect on water quality is expected in that watershed either. In Elross Creek, there are no water quality effects expected from the Howse Project and no cumulative effect on water quality of Elross Creek is therefore expected either.

8.4.3 Mitigation

Since no cumulative effect is expected from Howse Project, no mitigation measures are suggested here.

The largest cumulative effect will come from the different mining projects discharging their effluent into the Howells River watershed, ultimately ending up in Howells River, a fish habitat that hosts many species of fish, including Ouananiche. It is also a socially important water body where subsistence fishing and recreation is common. No at-risk fish species have been documented in Howells River. Concerning water quality and aquatic fauna, the accumulation of effects will take place in the Howells River since the projects discharge in different tributaries or directly in Howells River. Therefore, since the Howse Project dilution factor is above 1 in 50 once the effluent reaches Howells River, and since the discharge is more than 4 km upstream of the Howells River itself, increasing sedimentation and filtration potential, a very small proportion of any potential cumulative effect would be linked to this project. The relative cumulative effect of Howse Project on water quality and aquatic fauna is therefore considered negligible in the Howells River, particularly when compared to planned (Taconite) Projects. It is therefore considered as non-significant and further cumulative effect analysis should not be conducted in the context of this EIS.

8.4.4 Residual Effects Significance Assessment

Larger mining projects located close to Howells River could have an effect on its water quality, but enforcement of tight monitoring programs as required by the MMER should keep effects at an acceptable level (low effect) if water quality and aquatic fauna monitoring of Howells River is implemented to identify changes early on.

Since no cumulative effect is expected from the Howse Project, no significance assessment will be performed for this component.

8.4.5 Follow up and Monitoring Programs

A water quality monitoring program will be implemented at the limit of the LSA to confirm that contaminants do not reach beyond the LSA as stated above. It will consists of a quarterly water quality sampling at Triangle and Burnetta Lake discharges. Full details are provided in section 9.1.6.

In the unlikely event that there are contaminants reaching beyond the LSA, Howse Project should be included in a multi-project monitoring program that could take the form of a comprehensive EEM based on the MMER but spread between the different project inflows in the Howells River and paid for by the projects involved according to their respective contaminant discharge quantities.

8.5 WETLANDS CUMULATIVE EFFECTS ASSESSMENT

8.5.1 Scoping

The cumulative effects of loss of wetlands from the Howse Project and nearby Projects is considered for this cumulative effect assessment. The study area considered for cumulative assessment corresponds to an area of 280 km^2 which represents the upper section of the Howells river watershed.

The past mining activities are not considered for the cumulative effects on loss of wetlands. Although it is inconceivable that past IOCC operations did not destroy wetlands in the Howse Project RSA, the lack of literature on wetland distribution prior to IOCC activities precludes the possibility of assessing the cumulative effects of past projects. Observations of current wetland distribution allows us to infer that a wetland was sectioned by an IOCC road in the area where the OB stockpile/waste dump are currently proposed under the Howse Project. However, the original extent of this wetland was not documented and so the damage resulting from past IOCC activities cannot be assessed. It is therefore impossible to quantify the loss of wetlands from the past IOCC mining activities. It is also impossible to evaluate the loss of wetlands that might result from the future projects. Consequently, only the current mining operations are considered for the loss of wetlands.

Current mining operations that are considered in this analysis are the LIM Projects (James, Silver Yards and Redmond) and TSMC Projects (DSO 1a, 2a, 2b). On LIM Properties (1 300 ha), a total 133 ha of wetlands were identified on the properties. Less than 1 ha was expected to be affected by the mining operations (LIM 2009). For the TSMC projects, a terrestrial ecosystem mapping was carried out and about 27 000 ha of wetland were identified and 15 ha was expected to be affected by the different mining projects (NML and PFWA, 2009).

Including Howse, about 37 ha of wetlands are expected to be affected by mining operations. Wetlands are common on the territory and are even more present regionally in the Howells River and Swampy Bay watersheds. No unique type of wetlands will be loss due to mining operations. Based on the fact that the affected area is non-significant, wetlands are not considered as VC for the cumulative impact assessment and therefore not require further analysis.

8.6 CARIBOU CUMULATIVE EFFECTS ASSESSMENT

8.6.1 Scoping

The cumulative effects of noise and light from the Howse Project and nearby Projects on both migratory and boreal forest ecotypes are considered for this cumulative effect assessment. The study area considered for cumulative assessment corresponds to the entire GRCH herd range and the Lac Joseph and Québec herds ranges, which overlap the Tshiuetin and QNS&L railways corridor. This large study area is included because it allows the Proponent to further consider herd-wide effects. As presented in Figure 8-1, several

past, present or future mining projects are concentrated in the RSA, increasing the probability of cumulative effects on both caribou ecotypes.

Cumulative anthropogenic disturbances originate from the Schefferville area, the Labrador-West area, and rail traffic occurring over a 573-km long corridor (Figure 8-1). As such, in addition to Howse-derived noise and light disturbances, we consider the effect of the rail traffic on caribou for the period 1954-2024, which corresponds to the beginning of industrial activities in the region and planned ending of the Howse Project activities. The Howse Project makes use of existing rail infrastructure and so we consider the additional effects of Howse only, which are associated with rail traffic effects.

We use technical studies for Noise and Vibration and Light, which were produced specifically for the Howse Project for our analyses below. (Volume 2, Appendices F and G, respectively). Both these studies consider DSO3 activities

8.6.2 Analysis

Noise and Light

Near the Howse Project mine area, past IOCC mining activities and other DSO mining activities are ongoing and contribute to anthropogenic disturbances such as noise and light emissions. The Taconite project, which may vary in scale depending on the option selected (Labmag, KéMag or combined projects), and Block 103 will also increase anthropogenic disturbance and functional habitat loss (Section 8.2). Under the present ecological context it is expected that caribou have become habituated to the noise associated with the mining activities in the Schefferville region and that the addition of noise from the Howse mining activities will not significantly affect caribou behavior. This is furthered by the assessment that average pre-Howse noise levels are 34.6 dBA (averaged from 9 receptors) and the addition of Howse noise levels yield an expected mean value of 36.9 dBA. Analysis of the future worse-case scenario (including train operations, crushing site, roads and mini-plant) yields a mean value of 38.4 dBA (see Volume 2 Supporting Study F for full analysis details). Volume 2 Supporting Study F reports that a crusher which will serve to produce and sell material to first nations as well as the Mine Track Drill will account for the highest noise effects calculated.

According to light modelling results, the cumulative effects of Howse and surrounding projects will be highest in winter, due to snow reflectance. Under this nighttime scenario, the artificial sky brightness due to Howse and surrounding projects is negligible (for example, at Irony Mountain, the artificial sky radiance level is 8.9% of the natural radiance in winter but 7.5% of that amount is coming from Schefferville (Volume 2 Supporting Study G). Further, at a distance of 15 km from the Howse site, the contribution of DSO3 Projects to artificial light relative the contribution of Schefferville/Kawawachikamach is equal, indicating that at this threshold of caribou perception, artificial light contribution to the night sky is negligible.

Railway

The presence of caribou in the Howse Project RSA will be affected by the proximity of the QNS&L railway. A full list of projects considered for the cumulative effects analysis is available in Section 2.1. Further noise and light disturbance is expected if the following linear infrastructure is developed:

- a new railway to accommodate the upcoming activities planned by Champion Iron Resources Limited and Adriana Resources; and
- a ferroduct planned by NML and TSMC (Taconite project) to transport iron concentrate from Schefferville to Sept-Îles.

The presence of the railroad represents functional habitat loss for caribou (Nelleman and Cameron, 1998), as their ranges overlap the QNS&L railway. In the near future, the area may be crossed by three railways

with associated increasing traffic. The linear infrastructure can destroy/fragment habitat, cause avoidance by caribou, and create movement corridors by predators. Although all of these effects are possible, they are impossible to predict at this stage. The Proponent therefore is committed to practicing adaptive management and be engaged with local caribou groups to be updated on sightings.

Consulted participants mentioned repeatedly that the caribou was absent in the area during IOCC operations, which ended in 1982. The caribou came back in the area when operations ended, and then left again once mining activities resumed in the area, around 2005. For the participants, there is a clear relation between mining activities and the absence of caribou, although they are aware that mining is not the only factor.

8.6.3 Mitigation

In addition to the previsouly-mentioned standard and specific mitigation measures for caribou (no power lines will be constructed for the Howse Project, most activities will be during the day time, and there will be limited mining activities during the winter months), the proponent will practice adaptive management of the caribou in the vicinity of the Howse Project. Cooperation with local caribou monitoring programs allow HML to stay informed on the local herds and take a proactive approach if caribou are seen within certain buffer zones around the Howse Project and its neighboring projects. HML/TSMC also suggest to put in place a Caribou joint comity if other companies (NML, Champion, Adriana) start their operations. This comity will be responsible to jointly plan their mitigation measures if caribou are seen in the region.

Volume 2 Supporting Study F recommends locating the First Nations crusher (currently slated to be south of the deposit) further north to reduce noise effects. Further, the noise effects of the drill can be mitigated by reducing drilling speed and time, utilising a noise shroud and a mobile noise screen. It is noted here that the First Nations crusher is currently no longer considered as a component of the Howse Project.

8.6.4 Residual Effects Significance Assessment

At the level of the RSA, the Howse and surrounding Projects activities- noise, light and railway - exhibit a very small amount of disturbance on caribou, and the ecological services to the herds are largely preserved. Further, the DSO and Howse project are implemented in an already disturbed zone and the effect of Howse on caribou habitat is minimal if compared to other larger projects such as DSO, Taconite or Adriana. .

The project and activities surrounding the Howse Project are located in an area that has historically been continuously and significantly altered by human activities for decades. This disturbance is expected to continue indefinitely. Within this context of a pre-established mining complex, the Howse footprint is not expected to cause significant detrimental additions to this unfavorable ecological context. The GRCH has experienced significant declines over the last several decades, thereby producing a precarious ecological context for the GRCH. However, caribou are known to be resilient to disturbances caused by mining infrastructures (i.e. Weir et al., 2007), and have shown plasticity in their adaptability to anthropogenically-altered landscaped. It is expected that following a site restauration program, the ecological context of the GRCH will not be altered by the Howse Project.

Table 8-4 presents assessment criteria applicable specifically to caribou.

Table 8-4 Assessment Criteria Applicable for the Cumulative Effects on Caribou

TIMING		
Inconsequential timing	**Moderate** timing	**Unfavorable timing**

Timing of predicted Howse activities are not expected to affect any sensitive activities in the caribou life cycle.	Timing of predicted Howse activities may affect some caribou activities, i.e.: winter forage availability migration routes.	Timing of predicted Howse activities may affect some key caribou activities, i.e.: the calving period.
SPATIAL EXTENT		
Site specific	**Local**	**Regional**
The Howse Project and surrounding projects activates will effects a small portion of the RSA	The Howse Project and surrounding projects activates will effects at least half of the RSA	The Howse Project and surrounding projects activates will effects nearly all of the RSA
DURATION		
Short	**Medium**	**Long**
The effect of the Howse Project and surrounding projects on caribou will last less than 12 months and will not likely cause changes to the caribou herds.	The effect of the Howse Project and surrounding projects on the caribou will last between 12 or 24 months corresponding to one (maximum of two) caribou annual migration. Extends beyond the preparation/construction phase, but shorter than the lifespan of the Project.	Longer than 24 months, possibly as long as the project duration. The Howse Project and surrounding projects will likely cause long-term demographic changes to the caribou.
REVERSIBILITY		
Reversible	**Partially reversible**	**Not reversible**
The caribou are expected to return to their pre-Howse population status and distribution.	Effect on caribou will persists after the decommissioning and reclamation phase but caribou are expected to largely return to their pre-Howse status.	Caribou will be permanently altered by the Howse Project and surrounding projects.
MAGNITUDE		
Low	**Moderate**	**High**
Effect will be at the individual level.	Effect will be felt on a subsection of the nearby caribou herds.	Effect will be at the herd-level.
FREQUENCY		
Once	**Intermittent**	**Continual**
The disturbance will occur once.	The disturbance will be occasional, such as only at night.	The disturbance will be year round.

Timing

All mining activities will occur throughout the year. In particular, caribou will exhibit deterrence behavior related to noise and light, which will be produced continuously, and so the timing of the disturbance may occur during the calving period, and so the effect is high (Value of 3)

Spatial extent

The effects of noise and light and the railway will effects a small area when compared to adjacent anthropogenic activities. Further, the Howse Project will have effects on a small portion of the RSA (Value of 1).

Duration

The effects of noise and light will occur for as long as the project duration. However, although caribou are known to alter their behaviour to avoid anthropogenically-disturbed areas, they can also become accustomed to these disturbances over time (Haskell and Ballard 2008; Johnson and Russell 2014) Further, the Howse Project duration is short (approximately 12 years) relative other Projects (up to the year 2050), and therefore has a relatively short effect on caribou (Value of 2).

Reversibility

Although with the Howse Project alone, the caribou could be expected to return to area at the end of the Howse activities, the cumulative effects of the surrounding mine activities will make this reversibility *at the end of the Howse Project* unlikely. However, once the anthropogenic disturbances end and sites are largely restored, it is not unreasonable that caribou will return to the Schefferville area with time. (Value of 1).

Magnitude

The magnitude of the effects of light and noise on caribou is negligible, since Howse includes only 1 pit, as compared to the rest of the complex of DSO-wide operations, and so is not expected to contribute substantially to the overall light and noise production. Further, the effects on the railway on caribou will likely be at the individual level, since herds overlap with the rail line is small (Value of 1).

Frequency

Light disturbance will only occur at night, and noise disturbance will be continuous. However, when added and compared to DSO, noise and light will be continual (Value of 2).

8.6.4.1 Significance

The cumulative residual effects of the Howse Project on caribou are expected to be non-significant (value of 10). This is expected given the scale of the Howse Project relative the Project *complexes* in the vicinity. Further, the Howse Project makes use of pre-existing facilities where possible, thus reducing detrimental effects on caribou.

The most damaging characteristics of light a noise effects on caribou are the duration of the effect (the entire life of the mine) and the frequency (discontinuous/regular).

Likelihood

The likelihood of Howse having an effect on the GRCH herd is **unlikely** because no caribou have been seen in the vicinity of the Howse Project in the last 5 years and calving grounds have shifted away from the area.

8.6.5 Follow up and Monitoring Programs

Monitoring Programs such as the Ungava Program (see details in Table 7-83) will allow HML to stay informed on caribou movements in the area and practice an adaptive management method in the monitoring of caribou.

8.7 AVIFAUNA CUMULATIVE EFFECTS ASSESSMENT

8.7.1 Scoping

The cumulative effects of noise, light and habitat loss from the Howse Project and nearby Projects on, grouses, ptarmigans, migrating birds and species at risk are considered for the cumulative effect assessment. Near the Howse Project mine area, past IOCC mining activities significantly modified habitat distribution and have caused habitat loss for avifauna. Other ongoing DSO mining activities (TSMC and LIM) haves also contributed to habitat loss but also to noise and light. The Taconite project, which may

vary in scale depending on the option selected (Labmag and KéMag deposits), and Block 103 will also increase habitat loss for birds much more than Howse Project will ever do. In total, 114 species can be found regionally, and most of them are protected by the Migratory Bird Convention or the Species at Risk Act. There are no official population estimates for the Rusty Blackbird and Gray-cheeked Thrush, which are at-risk species in Labrador. However, from a regional point of view (20 km radius), it is estimated that suitable habitats could support up to 1,094 Rusty Blackbird pairs and 6,254 Gray-cheeked Thrush pairs (Section 7.4.8.2). There are no population estimates for Red-necked Phalarope nor Bank Swallow. No species of birds found in the region is exclusive to this geographic zone. However, several past, present or future mining projects, are concentrated in the RSA, increasing the probability of cumulative effects on avifauna.

8.7.2 Analysis

Habitat loss, Noise and Light

Cumulative anthropogenic disturbances mainly occur in the Schefferville area. Near the Howse Project mine area, past IOCC mining activities significantly modified the local landscape and potential bird habitats. Other DSO (TSMC and LIM) mining activities are ongoing and contribute to anthropogenic disturbances such as noise and light emissions. The Taconite project, which may vary in scale depending on the selected option (LabMag and KéMag deposits), and Block 103 will also increase anthropogenic disturbance and habitat loss.

Cumulative habitat loss caused by mining projects in the Schefferville vicinity remains the main threat for bird survival, including for the Rusty Blackbird, Gray-cheeked Thrush and Red-necked Phalarope, which are at-risk species. However, suitable habitats remain common, both locally and regionally, and most of the territory is still undisturbed. Therefore, no bird species are seriously threatened in the short and medium term. As the abandoned pit will constitute potential breeding habitats for Bank Swallow, cumulative effects for this species can be considered as beneficial.

In the long term, the increasing number of mining projects in the RSA could pose a more significant threat in terms of habitat loss for the Rusty Blackbird the Gray-cheeked Thrush and the Red-necked Phalarope, three species at risk found in the LSA. Bank Swallow is found in the LSA but eventually benefits of potential nesting sites in abandoned pits.

The Harlequin Duck and Short-eared Owl, which are also at-risk species, can be found in the RSA but are not directly affected by the Howse mining project. However, these species could potentially be harmed by the cumulative effects of the various projects over the long term.

The Howse Project area does not support significant breeding and staging areas for ducks and geese. High-quality breeding and staging habitats are found in the Howells River Valley, as indicated by the surveys (Section 7.4.8.1).

According to light modelling, the cumulative effects of Howse and surrounding projects will be highest in winter due to snow reflectance a period where no species at risk or birds protected under the Migratory Bird Convention are present.

The effects of noise from the Howse and DSO3 Projects will, at maximum, 5 dba at 1 km from the site. The exceedance over 5dba threshold is primarily due to the drilling activities and the First Nations crusher on tires. Therefore, potential disturbances on birds caused by noise will be extremely limited.

8.7.3 Mitigation

In addition to the previously mentioned standard and specific mitigations measures for avifauna, the proponent will participate to breeding birds and species at risk monitoring surveys as a follow up. Rusty Blackbird, Gray-cheeked Thrush, Red-necked Phalarope and Bank Swallow will be specifically monitored at a local scale to generate better population understanding of their response to the Project.

8.7.4 Residual Effects Significance Assessment

Birds breeding in boreal ecosystems where frequent small and large scale natural disturbance have occurred historically may be more resilient to human-induced to habitat changes. The subarctic forest is heavily fragmented, with strong edaphic and elevational gradients at the local and regional scales which have forced birds to adapt to patchy habitats. Further, the RSA does not include any unique habitats. As such, it is expected that avifauna will find alternate breeding grounds nearby and thus is generally considered as being resilient to such disturbance.

Table 8-5 Assessment Criteria Applicable for the Cumulative Effects on Avifauna

ECOLOGICAL CONTEXT		
Inconsequential timing	**Moderate** timing	**Unfavorable timing**
Timing of predicted Howse activities are not expected to affect any sensitive activities in the bird's life cycle.	Timing of predicted Howse activities may affect some bird's activities, i.e.: migration, late rearing, moulting.	Timing of predicted Howse activities may affect some critical bird's activities, i.e.: breeding and brooding or during migration in an important staging area.
SPATIAL EXTENT		
Site specific	**Local**	**Regional**
The Howse Project and surrounding activities will effect a small portion of the RSA	The Howse Project and surrounding projects activities will effect at least half of the RSA	The Howse Project and surrounding projects activities will effect nearly all of the RSA
DURATION		
Short	**Medium**	**Long**
The effect of the Howse Project and surrounding projects on avifauna will last less than 12 months and will not likely cause en effect on the population.	The effect of the Howse Project and surrounding projects on the avifauna will last between 12 or 24 months. Extends beyond the preparation/construction phase, but shorter than the lifespan of the Project.	Longer than 24 months, possibly as long as the project duration. The Howse Project and surrounding projects will likely cause long-term demographic changes to the avifauna.
REVERSIBILITY		
Reversible	**Partially reversible**	**Not reversible**
The avifauna is expected to return to their pre-Howse population status and distribution.	Effect on avifauna will persists after the decommissioning and reclamation phase but avifauna are expected to largely return to their pre-Howse status.	Avifauna will be permanently altered by the Howse Project and surrounding projects.
MAGNITUDE		
Low	**Moderate**	**High**
Effects will likely be on a few individual birds	Effects will likely have be on groups of birds.	Effects will likely be on bird populations level

FREQUENCY		
Once	**Intermittent**	**Continual**
The disturbance will occur once.	The disturbance will be occasional or intermittent	The disturbance will be year round.

Timing

Howse Project activities will occur throughout the year, with minimal winter blasting. Birds might exhibit deterrence behavior related to noise and light from the Project since noise and light produced by the Howse Project activities will be produced continuously. There will be no vegetation clearing during summer, when critical bird activities occurs. As there is no important staging area in the Howse area during spring and fall migration, the timing is thus evaluated as moderate (Value of 2).

Spatial extent

Avifauna will modify their breeding behaviour as a direct result of the Howse Project. However, the effect will be a small area when compared to adjacent anthropogenic activities. Further, the Howse Project will have effects on a small portion of the RSA. The cumulative effects of noise and light will be negligible too on a regional point of view. (Value of 1).

Duration

The avifauna is expected to interact with the effects of noise, light and habitat loss for the entire duration of the project, and as long as the mining site will not be restored. However, the Howse Project duration is short (approximately 12 years) relative to other Projects (up to the year 2050), and therefore has a relatively short effect on avifauna (Value of 2).

Reversibility

Although with the Howse Project alone, some avifauna will have to find new breeding sites, no species is expected to be temporarily or permanently extirpated of the RSA. Therefore, once the anthropogenic disturbances end and sites are largely restored, it is highly likely that all species of birds encountered will return to the sites (Value of 1).

Magnitude

The magnitude of the effects of light, noise and habitat loss on birds is negligible, since Howse includes only one pit, as compared to the rest of the complex of DSO-wide operations, and so is not expected to contribute substantially to the overall light, noise production. Habitat loss will essentially have an effect in the LSA due to the abundance of residual natural habitats nearby (Value of 1).

Frequency

Light disturbance will only occur at night, and noise disturbance will be continuous. However, when added and compared to DSO, noise and light will be continual. Habitat loss will be dealt more during the breeding season during the breeding season, between May and August which represent 25% of the year. (Value of 2).

8.7.4.1 Significance

The cumulative residual effects of the Howse Project on avifauna are expected to be non-significant (value of 9). The primary threat to avifauna in general following mitigation measures is habitat

alteration, specifically related to the duration and frequency of noise and light disturbance, which can result in behavioral reactions

This non-significant effect is expected given the scale of the Howse Project relative to the Project *complexes* in the vicinity. Further, by making use of pre-existing facilities where possible, the detrimental effects on avifauna in general are reduced, particularly habitat loss. As a matter of fact, an important part of the Howse Project is located on already altered habitats with very low potential for avifauna use, limiting to a minimum adverse effects.

Likelihood

The likelihood of Howse having an effect on grouses, ptarmigans, migrating birds and on species at risk such as Rusty Blackbird, Gray-cheeked Thrush, Red-necked Phalarope and Bank Swallow is **likely** because all of these species were observed in the vicinity of the Howse Project in the last 5 years, including in 2015. As no Common Nighthawk nor Olive-sided Flycatcher have been seen in the vicinity of the Howse Project, the probability of Howse having an effect on these components is **very unlikely**.

8.7.5 Follow up and Monitoring Programs

Breeding bird surveys with point count methods and species at risk adapted protocols will allow HML to stay informed on avifauna in the area.

8.8 HUMAN HEALTH CUMULATIVE EFFECT ASSESSMENT

8.8.1 Scoping

The effects of air emissions from the Howse Project and nearby projects (e.g. DSO3 and DSO4) on air quality are considered in this cumulative effect assessment. The study area considered for cumulative assessment encompasses sensitive receptors of interest in the RSA and mining / processing / hauling activities associated with Howse, DSO3 and DSO4 located within the LSA. The air dispersion modelling report provides explanations on how air emissions sources from the three projects were incorporated in the calculations. The Howse, DSO3 and DSO4 projects are interconnected and their operation schedules will coincide at a future point. This interconnection necessitated a global approach to the air modelling study.

8.8.2 Analysis

Similar to the analysis of health risk for the project-only operation, a multi-media exposure and risk assessment was conducted to assess cumulative health risk form the project plus other local/regional activities.

For non-carcinogenic substances, a hazard quotient (HQ) is the measurement endpoint and is calculated as the ratio of the estimated daily exposure (dose) to the safe dose for each contaminant. These contaminants are threshold acting stressors, in that no health risks are predicted provided a threshold of safe exposure is not exceeded. The hazard quotient is a numerical metric of how a receptor's daily dose compares to what is toxicologically considered to be the safe dose, over a prolonged (chronic) period.

For substances with a non-threshold dose response (i.e., carcinogens) the risk estimate is a calculation of the Incremental Lifetime Cancer Risk (ILCR). ILCR is the predicted risk of an individual in a population of a given size developing cancer over a lifetime. The ILCR is expressed as the one additional person per "n" people that would develop cancer, where the magnitude of n reflects the risks (i.e., probability) to that population. For example, in Canada the lifetime probability of developing cancer is ~0.4 (40%), or 40 out of 100 people. An increase in the incremental lifetime cancer risk of 1E-5, would result in a probability of

0.40001, a 0.0025% increase relative to background cancer incidence. Due to the estimation nature of the prediction of ILCR, Health Canada recommends that ILCRs only be calculated for adult exposures.

To provide interpretive insight on the risk (impact) levels and conservative assumptions employed to offset various sources of uncertainty normally encountered in health risk assessment, the following categories were used to describe the risk magnitudes for non-carcinogenic compounds:

- **Negligible: HQ<1.0.** (consistent with Health Canada (2010a,b) guidance for a comprehensive multi-media exposure and has become accepted common practice)
- **Low and likely to be negligible: 1.0>HQ≤10** (acknowledges in this case that considerable conservatism is employed by the risk assessor and that over estimation of risk is likely)
- **Potentially elevated: HQ>10** (acknowledges in this case that considerable conservatism is employed by the risk assessor and that over estimation of risk is likely)

In cases where an estimated HQ may exceed any of the above categories by a change of <10% from the Baseline case, the Baseline is noted as the risk driver, and the incremental contribution from the Project is considered separately for interpretation of significance.

For carcinogenic compounds, the magnitude of the cancer risk was rated as follows with similar interpretation as note above for hazard quotients:

- Negligible: ILCR ≤ $1x10^{-5}$
- Low and likely to be negligible: $1x10^{-5}$ < ILCR ≤$1x10^{-4}$
- Potentially elevated: ILCR>$1x10^{-4}$

Numerical results for the human health cumulative effects assessment are presented in Table 8-6 and Table 8-7 for adult and toddler receptors, respectively. The effects were predicted based on air quality modelling performed specifically for the cumulative effects scenario.

Table 8-6 Predicted incremental Hazard Quotients for Adult receptors for the Cumulative Scenario assessment

	POTENTIAL CONTAMINANT OF CONCERN	ROUTE OF EXPOSURE					TOTAL
		Soil Ingestion	Particulate Inhalation	Soil Dermal Contact	Surface Water Ingestion	Country Food Ingestion	
CUMULATIVE INCREMENT	Arsenic	3.3E-05	2.2E-04	8.6E-06	0.0E+00	4.1E-03	4.4E-03
	Barium	3.7E-08	1.2E-06	4.5E-07	0.0E+00	0.0E+00	1.6E-06
	Beryllium	1.9E-10	2.0E-07	2.3E-07	0.0E+00	2.3E-07	6.7E-07
	Chromium	3.8E-07	9.7E-05	2.5E-05	0.0E+00	4.0E-04	5.3E-04
	Iron	1.6E-04	1.2E-02	1.4E-04	0.0E+00	0.0E+00	1.2E-02
	Lead	1.5E-05	8.2E-05	1.3E-04	0.0E+00	5.5E-04	7.8E-04
	Manganese	9.0E-08	1.3E-05	1.9E-05	0.0E+00	0.0E+00	3.3E-05
	Mercury	4.8E-08	2.2E-04	4.1E-07	0.0E+00	2.6E-05	2.5E-04
	Molybdenum	3.2E-11	2.2E-10	2.7E-12	0.0E+00	1.4E-08	1.4E-08
	Selenium	2.9E-11	1.7E-10	2.5E-12	0.0E+00	1.1E-09	1.3E-09

Table 8-7 Predicted incremental Hazard Quotients for Toddler receptors for the Cumulative Scenario assessment

	POTENTIAL CONTAMINANT OF CONCERN	ROUTE OF EXPOSURE					TOTAL
		Soil Ingestion	Particulate Inhalation	Soil Dermal Contact	Surface Water Ingestion	Country Food Ingestion	
CUMULATIVE INCREMENT	Arsenic	5.7E-04	9.6E-04	1.5E-05	0.0E+00	1.0E-02	1.2E-02
	Barium	6.3E-07	5.0E-06	7.8E-07	0.0E+00	0.0E+00	6.4E-06
	Beryllium	3.3E-09	8.7E-07	4.0E-07	0.0E+00	4.7E-07	1.7E-06
	Chromium	6.5E-06	4.1E-04	4.3E-05	0.0E+00	1.2E-03	1.6E-03
	Iron	2.8E-03	5.2E-02	2.4E-04	0.0E+00	0.0E+00	5.5E-02
	Lead	2.6E-04	3.5E-04	2.3E-04	0.0E+00	1.3E-03	2.2E-03
	Manganese	1.8E-06	6.5E-05	3.8E-05	0.0E+00	0.0E+00	1.1E-04
	Mercury	8.3E-07	9.6E-04	7.1E-07	0.0E+00	6.5E-05	1.0E-03
	Molybdenum	6.6E-10	1.1E-09	5.7E-12	0.0E+00	6.0E-08	6.2E-08
	Selenium	4.6E-10	6.7E-10	4.0E-12	0.0E+00	2.8E-09	3.9E-09

- The predicted non-carcinogenic effects to adults and toddlers as provided above in Table 8-6 and Table 8-7 in the form of hazard quotients (HQs) indicate *the incremental cumulative operational risks to human health are negligible.*
- The predicted carcinogenic effects to adults (not tabulated but available from the HHRA technical support document) *indicate the incremental lifetime cancer risk (ILCR) from cumulative operational interactions to human health are negligible*.

8.8.3 Mitigation

Given that predicted effects to human health were negligible for the cumulative scenario, specific mitigation measures for human health under the cumulative effects scenario are not strictly warranted. However, mitigation measures for air quality are a prudent course of action. Mitigation for air quality in the cumulative scenario are listed in the air quality section of the EIS, and are reproduced below for convenience.

> *In addition to the previously-mentioned standard and specific mitigation measures for air quality, the proponent will practice adaptive management of the air quality in the vicinity of the Howse Project and in DSO areas as a whole. Adaptive management will be based on the air quality monitoring plan (AQMP) currently under review by the NL, QC and Kativik authorities. The AQMP will consist in the installation of a network of air monitoring equipment at several locations for several air pollutants such as: NOx, TPM, $PM_{2.5}$, metals and dustfall.*

8.8.4 Residual Effects Significance Assessment

The human health context of the residual effect significance for the cumulative effects scenario employs the same six criteria to characterize the significance of health effects of the project-only scenario: timing (as it relates to project activities or receptor behaviours), spatial extent (LSA versus RSA extent of an effect), duration (duration of a predicted effect), reversibility of a predicted effect, magnitude (measure as the hazard quotient or incremental lifetime cancer risk), and frequency of the effect. The criteria and the rationale for how they have been assigned to the residual effects are further defined in Table 8-8.

Table 8-8 Assessment Criteria Applicable for the cumulative effects on Human Health Risk

TIMING		
Inconsequential timing	**Moderate** timing	**Unfavorable timing**
Timing and seasonality of predicted Howse activities or human receptor activities has no significant effect on Human Health.	Timing and seasonality of predicted Howse activities or human receptors activities may affect Human Health.	Timing and seasonality of predicted Howse activities or receptors activities will significantly affect Human Health.
SPATIAL EXTENT		
Site specific	**Local**	**Regional**
Effects are limited to the footprint of the project.	Effects extend beyond the footprint, but do not extend outside the LSA. Further, a subsection of Human Health Risk habitat will be altered.	The effect of the Howse Project will affect Human Health Risk in substantial part or the entire RSA.
DURATION		
Short	**Medium**	**Long**
The effect of the Howse Project will last less than 12 months.	The effect of the Howse Project will last between 12 or 24 months (Extends beyond the preparation/construction phase, but shorter than the lifespan of the Project).	Health effects will last longer than 24 months, possibly as long as the project duration.
REVERSIBILITY		
Reversible	**Partially reversible**	**Not reversible**
Health Effects expected to return to their pre-Howse levels.	Health Effects can be reversed but only in certain locations and not others; or certain health effects may be reversible but others may not be reversible.	Health Effects are not reversible (e.g. cancer)
MAGNITUDE		
Low	**Moderate**	**High**
Hazard Quotients ≤1.0 and Incremental Cancer Risks ≤ 10^{-5} -or- Change in Risk relative to Baseline Case is <10%	1.0< Hazard Quotients ≤10 or 10^{-5} < Incremental Cancer Risks ≤10^{-4}	Hazard Quotients >10 or Incremental Cancer Risks >10^{-4}
FREQUENCY		
Once	**Intermittent**	**Continual**
When no health effect occurs.	N/A	When health effects occur it is considered continuous.

Timing

The criterion *timing* in the present context relates to how the timing of project activities or human receptor activities could exacerbate or ameliorate exposure and health risk. Air quality and the presence/absence of human receptors are the most relevant factors. Other factors such as dietary exposure are extended over long time-lines (e.g. year-round consumption of frozen traditional foods tends to dampen a seasonal exposure). Noteworthy in this risk assessment, is the adoptions of exposure scenarios with worse-case

exposure concentration and the assumption of receptors being present and exposed – notwithstanding the seasonality of hunting camps and summertime recreation. The multimedia exposure predicted total and pathway-specific exposure to yield negligible risk. Given this risk estimate is predicated on worse-case assumptions (e.g., conservatively high dietary consumption, high concentrations of air quality parameters), the influence of timing on the residual effect, although plausible, is considered inconsequential because the risk worse-case risk is negligible, and therefore *timing* is assigned a value of 1.

In the future, as new industrial entities become active in the area, it would be prudent to revisit and if warranted coordinate activities that may affect air quality or other environmental media to preserve the status of negligible residual effect of *timing* towards human health.

Spatial Extent

The concept of variable exposure concentrations beyond the project footprint is plausible. Because the health effects under the conservative assumptions are predicted to be negligible, the criterion of spatial extent is assigned a value of 1.

Duration

The residual effect criterion *duration* is considered in the context of duration of a significant health effect; the duration ranging from <12months to >24mo, the latter which may also encompass a significant risk of lifetime cancer. In the present instance, all conservatively assessed exposure pathways yielded negligible risk, as characterized by acceptable risk level defined by Health Canada. Accordingly, the criterion of duration of residual effect is assigned a value of 1.

Reversibility

The residual effect criterion *reversibility* is considered in the context of whether a significant health effect, if it was to occur, would be reversible within the timeframe of the project and/or physiologically reversible (e.g., cancer health effect). In the present instance, all conservatively assessed exposure pathways yielded negligible risk, as characterized by acceptable risk level defined by Health Canada. Accordingly, the criterion of reversibility does not strictly apply, and is assigned a value of 1.

Magnitude

The residual effect criterion *magnitude* is considered in the context of risk magnitude previously defined for ranges of hazard quotients (for non-cancer endpoints) and incremental lifetime cancer risk (ILCR). The categories were developed with consideration for Health Canada policy on acceptable health risk and conservative assumptions employed in the risk assessment. In the present instance, all conservatively assessed exposure pathways yielded negligible risk, as characterized by acceptable risk level defined by Health Canada. Accordingly, the residual effect criterion magnitude is assigned a value of 1.

Frequency

The residual effect criterion *frequency* is considered in the simplified context of whether a significant health effect is predicted to occur or not occur. It has not been considered in the context of number of people, as generally Health Canada policy for human health risk assessment is to consider significance of health risk to an individual, rather than frequency within a population. In the present instance, all conservatively assessed exposure pathways yielded negligible risk, as characterized by acceptable risk level defined by Health Canada. Accordingly, the residual effect criterion frequency is assigned a value of 1.

8.8.4.1 Significance

An overall cumulative effect of the Howse Project on human health is non-significant (value of 6). This conclusion is based on conservative exposure assumptions that err on the side of over – rather than under-estimating human exposure scenarios.

Likelihood

The likelihood for cumulative effects to human health based on current knowledge of the Howse project and external ancillary activities is considered very low, because the multimedia exposure assessment has employed numerous conservative assumptions, with consideration to traditional foods, Aboriginal traditional activities, and a comprehensive evaluation of the interaction of mine activities, air emissions and meteorological conditions that will influence air quality. Notwithstanding the conservative assumptions, the magnitude of health risk was found to be negligible for all exposure pathways, both individually and additively.

8.8.5 Follow up and Monitoring Programs

Monitoring for residual effects (project only or cumulative) is best focussed on indicators of exposure as this is more proactive than monitoring health effects per se. Monitoring health effects (i.e., health conditions) may also not provide robust cause-effect relationship.

Monitoring of exposure should target exposure media quality, specifically (i) air quality, game and fish meat quality, and berries/plant items, that may be traditionally consumed.

With respect to air quality monitoring, an exhaustive air quality monitoring report (AQMR) is currently under review by the NL, QC and Kativik authorities. The AQMR will consist in the installation of a network of air monitoring equipment at several locations for several air pollutants such as: NOx, TPM, $PM_{2.5}$, metals and dustfall. A draft version of the AQMR is provided in Volume 1 Appendix XXIV.

8.9 SOCIOECONOMIC CONDITIONS OF ABORIGINAL PEOPLE

8.9.1 Scoping

Cumulative effects of the Howse Project and surrounding projects on socioeconomic conditions of Aboriginal people include:

- the possibilities for employment and training; and
- contracting opportunities.

Both represent positive benefits for the local population, as the mining industry is the core economic sector in the Schefferville area outside of local government institutions. However, comments made during the consultation process indicated that a) the perceived benefits from mining companies are not meeting expectations in terms of the number of jobs and contracts at the local level and b) these positive benefits are contrasted by environmental effects of mining activities.

Spatial boundaries for this component are limited to the RSA, which follows the footprint of the Project roughly from the Schefferville region to Sept-Îles, from where the ore will be transported for transformation overseas. For the purpose of the cumulative effect assessment, the RSA includes three zones of populated areas: Schefferville, Labrador West and Sept-Îles areas.

The temporal boundaries go back to the beginning of the IOCC mine construction, which included the construction of the QNS&L railway in the 1940s, and coincide with the progressive sedentarization of the Innu and Naskapi in the Schefferville area, as well as with the creation of the municipality of Schefferville

(1955) (Clément 2009a; Cooke 1976). The upper temporal limit corresponds to the end of the post-closure phase of the Howse Project activities, around 2037, which is 5 years following project decommissioning, once site closure and restoration works, and site monitoring are complete, and site stabilization has been reached.

The following analysis is based on concerns raised during Howse Project consultations with Aboriginal community members and land-users, as well as on existing literature on social effects of mining Projects (Alderon Iron Ore Corp. 2014; NML and PFWA 2009; Storey and Hamilton 2013). Information available from provincial and federal authorities regarding past, present, and future projects in the RSA was also taken into account (Table 8-2).

8.9.2 Analysis

Employment and training, as well as contracting, are essential to the local economy and to the maintenance and improvement of the quality of life of its residents.

The Schefferville region is characterized by:

- a limited labour pool with respect to:
  - population (less than 1,000 people 15 and over (Statistics Canada, 2011);
  - education levels (see section 7.5.3.2); and
  - the availability of a qualified labour force.
- a limited number of contractors and of services offered, with few if any opportunities for business diversification.

The *Comité sectoriel de Main-d'oeuvre de l'industrie des mines* (2015) has predicted that from 2015-2025, there will be 2,829 jobs in the mining sector on the North Shore region of Québec, given the low prices of the iron ore. It is difficult, however, to predict how many of these jobs are forecasted for the Schefferville region, which do not take into account jobs located on the Labrador side of the border.

There were approximately 1,000 people employed on the DSO Project in September, 2015, based on Full-Time Equivalent hours recorded, of which 150 were members of the NIMLJ, NNK and ITUM, and of the remaining workers, close to 60% were residents of NL. This number will decrease significantly to approximately 250 people in 2016 when the project's construction period has ended. There are three other projects planned to begin in the Schefferville region between 2015 and 2018 (DSO 4-2a, DSO 4-2b and Block 103, Table 8-2). In a context where the local availability of labour force and contactors will not be able to meet the demands, companies need to rely on a fly in- fly out system of operation which diminishes economic benefits at the local level by fulfilling jobs and giving contracts at the regional level. It is expected that the majority of these 'outside' workers will originate from Newfoundland and Labrador and Québec, as per Newfoundland and Labrador Benefits agreements (see section 7.5.3.5) and as per the trend for the DSO Project.

Aboriginal groups have signed IBAs for mining projects in the Schefferville region that establish employment and contracting priorities for Aboriginal Groups in order to secure a portion of the labour force and contracts required for the construction, operation and decommissioning of Projects. Training is essential to increase the capacity of the local population to fulfill job requirements, ideally technical jobs, and to seek career advancement, within mining companies and their contractors.

The mining sector is characterized by economic boom and bust cycles: the industry thrives when prices of iron are high, and retracts when prices slump. Employment and contracting opportunities are directly affected by these cycles. At the moment:

- The Schefferville region is seeing a decrease in employment and contracting opportunities, when compared to the number of projects that were under study from 2009-2012;
- Prices of iron ore are not expected to increase for the next 18 months[28]. Given that Schefferville is located on the Labrador Through, an increase in mining projects can be foreseen in the medium term, and when this occurs, the situation will likely change rapidly.
- HML is the only mining company operating in the region, (through its DSO Project) and employs a significant number of Innu and Naskapi (close to 150 in September of 2015).

Boom periods are positive for employment and contracting opportunities for the local communities. The cumulated effects of simultaneous projects can lead to competition between companies to recruit and to retain employees. Meeting labour needs may become difficult. Families benefit from the earnings, and municipalities and governments from taxation revenues.

During such periods, positive cumulated economic benefits will be felt throughout the RSA and potentially in other regions of NL and Québec, through employment and contracting opportunities that will be filled under a fly-in and fly-out regime. These opportunities will increase for the mining operation itself, and for the operation and maintenance of the railway and for port activities.

In contrast, downturn periods are associated to lay-offs and loss of business opportunities and may have significant negative effects on the local economy and on families. As explained in Section 7.5.1, the closing of the IOCC was a difficult experience for the Innu, the Naskapi and the non-Aboriginal population of Schefferville who remained in the region. This period was characterized by profound economic difficulties and affected the quality of life of all residents of Schefferville area. The recent reduction in mining activities – as of 2013 – has already affected the local communities in terms of job opportunities, as observed during the consultations for the Howse Project. Downturn effects may be enhanced in the context of cumulated projects, especially if all cease or reduce activities at the same time. This could occur between 2016 and 2032, depending on the length of the boom and bust cycles. This situation is due to absence of economic diversification in Schefferville area, as there are few job opportunities aside from mining activities and governmental organizations and services.

8.9.3 Mitigation

Any measures to minimize effects of mining activities on socioeconomic conditions will require the collaboration of all mining companies operating in the region and of local authorities in terms of assessments, implementation of measures, and monitoring. As such, the following measures and recommendations do not only concern HML, but the Schefferville region as a whole, where direct project effects are felt. The measures proposed below are for HML to implement, while the proposed recommendations require collaboration between mining companies, governments, and the affected communities.

Measures

While the Howse Project itself will have positive effects on employment, training and contracting, the local population has expressed that they would like to maximize these benefits at the local level.

HML addresses issues regarding cumulative effects with local authorities through its IBA Implementation Committees, the Community HSE Committee, the Regional Steering Committee on Mining Issues, the

[28] http://www.bloomberg.com/news/articles/2015-08-17/goldman-sees-iron-ore-slumping-30-on-supplies-peaking-demand. See also http://investingnews.com/daily/resource-investing/base-metals-investing/iron-investing/iron-ore-price-forecast-patricia-mohr-scotiabank/

elaboration of the joint emergency preparedness plan, and indirectly through its support and participation in Caribou Ungava. While there are currently no other mining companies operating in the region, it is through these means, or variations of these established jointly with other active mining companies, that measures aimed at mitigation effects will be elaborated. HML is also sits on the Labrador West Regional Task Force which aims to collaboratively address regional issues shared by municipalities, governments and mining companies. *HML will continue with its involvement in these means, and other initiatives, aimed at mitigating cumulative effects.*

Recommendations

With respect to the maximization of benefits and minimization of impacts to the Schefferville region, several actions can be taken by HML to overcome this difficulty:

- continue to work with local communities to maximize employment and business opportunities via respective IBA Implementation Committees;
- continue to address all HML/TSMC mining matters (Howse, Goodwood, DSO) under the aegis of the HSE Committee to monitor impacts and cumulative effects of mining operations.
- continue to participate in the Regional Steering Committee on Mining Issues (Schefferville), and the Labrador West Regional Task Force, and collaborate with other mining companies operating in the region to assess, address and monitor cumulative effects relating to mining. Discussion themes will be according to needs and priorities, and will include training, employment, contracting, and other issues that relate to the quality of life of the residents such as infrastructure capacity; traffic and road safety; effects of a fly-in, fly-out operation; communication with the local population; availability of public services; local sustainable development.
- continue to adhere to the Joint Emergency Preparedness Plan and collaborate with communities and other mining companies in doing so;
- Continue to collaborate in the Ungava Caribou research program in order to assess cumulative effects of mining on the GRCH;
- Work with mining associations and government to discuss and address cumulative effects issues
- Work with governments and communities to prepare a map showing all mining projects (proposed and ongoing), and which will guide land-users in harvesting resources in safe locations. These maps will be posted in public places.

8.9.4 Residual Effects Significance Assessment

The following table outlines the assessment criteria used to determine cumulative effects on socioeconomic conditions. The criteria and the rationale for how they have been assigned to the residual effects are further defined in Table 8-9.

Table 8-9 Assessment Criteria Applicable for the cumulative effects on Conditions of Aboriginal People

TIMING		
Inconsequential	**Moderate**	**Considerable**
Will not have an effect	Will have a moderate effect at times	Will have an effect at all times during all phases of the Project
SPATIAL EXTENT		
Site specific	**Local**	**Regional**

The Howse Project and surrounding projects activities will impact a small portion of the RSA	The Howse Project and surrounding projects activities will impact at least half of the RSA	The Howse Project and surrounding projects activities will impact nearly all of the RSA
DURATION		
Short	**Medium**	**Long**
The effect of the Howse Project and surrounding projects on socioeconomic conditions will last less than 12 months and will not likely cause changes.	Extends beyond the preparation/construction phase, but shorter than the lifespan of the Project.	The Howse Project and surrounding projects will likely cause long-term changes to socioeconomic.
REVERSIBILITY		
Reversible	**Partially reversible**	**Not reversible**
Full restoration of pre-development situation likely.	Effect on socioeconomic conditions will persists after the decommissioning and abandonment phase but are expected to largely return to their pre-Howse status.	Socioeconomic conditions will be permanently altered by the Howse Project and surrounding projects.
MAGNITUDE		
Low	**Moderate**	**High**
Affects a small proportion (<5%) of the population in the RSA.	Affects a limited proportion (5%-15%) of the population in the RSA.	Affects a significant proportion (>15%) of the population in the RSA.
FREQUENCY		
Once	**Intermittent**	**Continual**
~Once per year	Occasional/intermittent	Year-round (continual)

Timing

At the level of the RSA, the timing of the Howse Project alone has direct positive effects on socioeconomic conditions given that it will ensure that DSO operations are maintained, which are now the only mining activities taking place in the Schefferville region. However, it is difficult to predict when the price of ore will increase and at what point in time other mining companies will advance with their work in the Schefferville area. In the medium-term, it can reasonably be expected that projects other than Howse will be launched given the geological resources present in the Schefferville area. The timing effects of the cumulative effects are therefore considered moderate (Value of 2).

Spatial Extent

The spatial extent is local because the Howse Project and surrounding projects and activities will affect, likely positively, the socioeconomic conditions of Schefferville area generally (Value of 2).

Duration

The duration of the effect is difficult to predict as it will depend on mining sector conditions and interest in the Schefferville region by investors. Minimally, benefits associated with the Howse Project will be long since effects will be felt throughout its lifespan (Value of 3).

Reversibility

The effect will be partially reversible considering, for example, that skills learned during employment are transferable to other jobs; local enterprises will have obtained experience helping them to obtain other

contracts; and economic benefits will be reflected tangibly in improvements in the quality of life of the local population (Value of 2).

Magnitude

In the medium-term, it can reasonably be expected that projects other than Howse will become operational given the geology of Schefferville area. The magnitude of the effect could be moderate as it could affect a limited proportion (<15%) of the population in the RSA (Value of 2).

Frequency

The frequency is continual, as employment and contracts and required on a day-to-day basis for mining operations (Value of 2).

8.9.4.1 Significance

The cumulative residual effects of the Howse Project on socioeconomic conditions of aboriginal people are expected to be non-significant (value of 13, positive).

Likelihood

The likelihood of the Howse Project having a positive effect on socioeconomic conditions is high.

8.9.5 Follow up and Monitoring Programs

The means listed in Section 7.5.3.5.3, and variations thereof in collaboration with other mining companies once they become active in the region, should be implemented.

8.10 SUBSISTENCE AND TRADITIONAL ACTIVITIES

8.10.1 Scoping

Cumulative effects for subsistence and traditional activities are concentrated in the Schefferville area, where members of the NIMLJ and the NNK are particularly active, and where ITUM members are holders of family traplines. Subsistence and traditional activities include the following components:

- access to the local road network, access to lands, and road safety;
- subsistence and traditional caribou hunting;
- subsistence and traditional activities (hunting, fishing, trapping and berry/medicinal plant harvesting); and
- preservation of and access to Kauteitnat.

Spatial boundaries for this component are limited to the RSA, which follows the Project footprint roughly from the Schefferville area to Sept-Îles, from where the ore will be transported for transformation (Table 8-2). For the purpose of the cumulative effect assessment, the RSA includes three zones of populated areas: Schefferville, Labrador West and Sept-Îles.

The temporal boundaries go back to the beginning of the IOCC mine construction, which included the construction of the QNS&L railway in the 1940s, and coincide with the progressive sedentarization of the Innu and Naskapi in Schefferville area, as well as with the creation of the municipality of Schefferville (1955) (Clément 2009a; Cooke 1976). The upper temporal limit corresponds to the end of the post-closure phase of the Howse Project activities, around 2037, which is 5 years following project decommissioning, once site closure and restoration works, and site monitoring are complete, and site stabilization has been reached.

The following analysis is based on concerns raised during the Howse Project consultations with Aboriginal community members and land-users, as well as on existing literature on effects of mining Projects on harvesting activities and ATK (Alderon Iron Ore Corp. 2012; NML and PFWA 2009; Clément 2009a,b; Weiler 2009a,b; Volume 2 Supporting Study C). Information available from provincial and federal authorities regarding past, present, and future projects in the RSA was also taken into account.

8.10.2 Analysis

Mining activities have an impact on subsistence and traditional activities in a number of ways, as discussed during the consultations with land-users, including by:

- physically altering the environment where resources are harvested (open pits, waste rock piles, access roads, etc.);
- generating road traffic and issues related to access to land and road safety ; and
- generating dust potentially affecting air, land and water that in turn, potentially affecting wildlife and human health.

The consultations for the Howse Project revealed that the local population negatively anticipates the cumulative effects of future projects on subsistence and traditional pursuits, based on their experience with the IOCC and with the more recent mining projects, when several mining companies were operating in Schefferville area simultaneously (2008-2013).

While the number of projects and operations has diminished since 2013, it is important to keep in mind that Schefferville is located on the Labrador Through and that several projects may be developed or reactivated once the price of ore increases. The significance of the cumulative effects on land-use and subsistence activities varies according to the number of mining projects in the area.

Access to the local road network, access to lands, and road safety

Past IOCC mining activities have significantly modified the landscape in the Schefferville area, and harvesters currently rely on the road network that was built by IOCC to access the land during the period after spring thaw and before the accumulation of snow. With the development of mining, there are expectations that the road network, which will likely expand with each project, will be used in the future for traditional pursuits in the area (fast, safe, no need for camps, etc.). When mining activities cease, roads will be left for the use of the local population.

Harvesting activities carried out in the DSO project area, which includes the Howse Project proposed site, are limited (Volume 2 Appendices C and D). Harvesters either travel through this area to reach other locations (for the Innu, Rosemary Lake area in particular), or choose to go elsewhere to avoid disturbance by the mining activities. Local land-users have the opportunity to go elsewhere in the vicinity of Schefferville, as other similar harvesting sites can be found nearby. These alternatives may be reduced as projects develop in the future, requiring further travel, or may be constrained in other ways (other sources of contamination, other family trapline holders, etc.). The displacement of land-use activities may have several implications, including:

- Financial costs for families:
  - Increase in expenses related to equipment (fuel, camps, vehicles, etc.) and time spent reaching locations;
  - Increase in expenses on store-bought food as a result of reduced accessibility of traditional food;
- "Cultural costs":

- ATK is location-specific as well as species-specific. Going farther afield means frequenting areas about which knowledge is partial, and that knowledge may be not shared or only partially shared.
- It may be harder to involve youths in harvesting activities that require longer trips (e.g., school outings on the land may be more difficult to organize).

Cumulative effects relative to access to land and road safety only affect the Schefferville area. Road safety may be an issue when mining vehicles and land-users share the same roads. As such, the cumulative effects of mining projects could pose a limitation in terms of easy access to some harvesting zones (work sites being made off-limits for safety reasons, escorts through work zones) (Section 7.5.2.1). Bypass roads play an important role in diminishing risks in terms of road safety. Future issues will largely depend on the specific location of mining projects in the region.

Subsistence and traditional caribou hunting

All Aboriginal groups (NIMLJ, NNK, ITUM, NCC and IN) have expressed concerns regarding the preservation of caribou and of their cultural heritage, in which the caribou plays a key role (Section 7.5.2.1). It is expected that mining activities (noise and light, for instance) as well as the use of the QNS&L railway will continue to affect caribou habitat, taking into consideration the precarious state of the resource, and other current and future projects in the area (Menihek Generating Station, TSH, etc., see Section 8.2). The relation between effects of mining and the decline of the George River Caribou Herd has not been established as of yet. Cumulative effects on caribou subsistence hunting may be felt in the portion of the RSA where caribou may be found (Labrador West and Schefferville areas).

Subsistence and traditional activities (hunting, fishing, trapping and berry/medicinal plant harvesting)

Subsistence and traditional activities are already impacted by mining activities in Schefferville area. A key element raised during the consultation process is the fear of contamination of resources. As mining projects develop in the area, the population's fear of consuming contaminated resources will increase, depending on the location and scope of these Projects[29]. It is important to note that land-use is also highly related to the perception of land integrity. Land-users may refrain from using areas where they have doubts regarding the quality of the resources or on potential environmental contamination. This is turn may have an effect on ATK and on knowledge shared between generations of users.

Given the potential for multiple mining projects in the area, site restoration is of prime importance to the local population, as indicated during the consultations, as well as for the ITUM, NCC, and IN (Chapter 4). Proper decommissioning and restoration represent the only way for a safeguarded environment in the future, though there is recognition that this will take time, and that the landscape in the Schefferville area will continue to be affected by mining activities. Such cumulative effects will be felt in the Schefferville area where resources are harvested.

Preservation and access to Kauteitnat

The potential cumulative effects on Kauteitnat are only relative to Schefferville area. The importance and cultural significance of Kauteitnat for the local population has been presented in Section 7.5.2.1. Potential cumulative effects on Kauteitnat will largely depend on the location of future projects. Until the prices of iron ore increase, there will be no further effects on Kauteitnat. Local land users will continue to have access to Kauteitnat.

[29] However, the HHRA study (Volume 2 Supporting Study D) has demonstrated that resources would not be contaminated by dust generated by mining activities including road traffic.

8.10.3 Mitigation

Any measures to minimize effects of mining activities on subsistence hunting and activities will require the collaboration of all mining companies operating in one given area and of local authorities in terms of assessments, implementation of measures, and monitoring. As such, the following recommendations does not only concern HML, but the Schefferville area as a whole, where direct project effects are felt. The proposed recommendations require concerted actions between mining companies, governments, and the affected communities.

Recommendations

The following means have been identified to oversee and address cumulative impacts on subsistence and traditional activities.

With respect to the maximization of benefits and minimization of impacts to the Schefferville region, several actions can be taken by HML to overcome this difficulty:

- continue to address all HML/TSMC mining matters (Howse, Goodwood, DSO) under the aegis of the HSE Committee to monitor impacts and cumulative effects of mining operations.
- continue to participate in the Regional Steering Committee on Mining Issues (Schefferville), and the Labrador West Regional Task Force, and collaborate with other mining companies operating in the region to assess, address and monitor cumulative effects relating to mining.
- continue to collaborate with Université Laval, the government of Québec and the GNL in the Ungava Caribou research program in order to assess cumulative effects of mining on the GRCH;
- work with mining associations and government to discuss and address cumulative effects issues;
- work with governments and communities to prepare a map showing all mining projects (proposed and ongoing), and which will guide land-users in harvesting resources in safe locations. These maps will be posted in public places.

8.10.4 Residual Effects Significance Assessment

Mining development will continue in northern Québec and Labrador. In the long term, environmental disturbances caused by mining and other related projects are expected to increase, which could potentially further impact access to land, road safety and subsistence and traditional activities by Aboriginals. However, roads built by mining companies would be positive in the long term by allowing greater and easier access to the territory. During the construction and operations phases, however, a collaborative approach between the mining industry and harvesters will need to be maintained in order to ensure continued cohabitation with land-users.

At the moment, access to land is maintained, but it is difficult to predict how this could change with the advent of several mining projects in the Schefferville area.

The following table outlines the assessment criteria used to determine cumulative effects on subsistence and traditional activities.

Table 8-10 Assessment Criteria Applicable for the cumulative effects on Subsistence and Traditional Activities

TIMING		
Inconsequential	**Moderate**	**Considerable**

Will not have an effect	Will have a moderate effect at times	Will have an effect at all times during all phases of the Project
SPATIAL EXTENT		
Site specific	**Local**	**Regional**
The Howse Project and surrounding projects activities will impact a small portion of the RSA	The Howse Project and surrounding projects activities will impact at least half of the RSA	The Howse Project and surrounding projects activities will impact nearly all of the RSA
DURATION		
Short	**Medium**	**Long**
The effect of the Howse Project and surrounding projects on subsistence and traditional activities will last less than 12 months and will not likely cause changes to the subsistence and traditional activities.	Extends beyond the preparation/construction phase, but shorter than the lifespan of the Project.	The Howse Project and surrounding projects will likely cause long-term changes to the subsistence and traditional activities.
REVERSIBILITY		
Reversible	**Partially reversible**	**Not reversible**
Full restoration of pre-development situation likely.	Effect on subsistence and traditional activities will persists after the decommissioning and abandonment phase but subsistence and traditional activities are expected to largely return to their pre-Howse status.	Subsistence and traditional activities will be permanently altered by the Howse Project and surrounding projects.
MAGNITUDE		
Low	**Moderate**	**High**
Affects a small proportion (<5%) of the population in the RSA.	Affects a limited proportion (5%-15%) of the population in the RSA.	Affects a significant proportion (>15%) of the population in the RSA.
FREQUENCY		
Once	**Intermittent**	**Continual**
~once per year	Occasional/intermittent	Year-round (continual)

Timing

The Howse Project activities alone will have a moderate effect on the timing of subsistence and traditional activities as levels of impacts will vary for each component (e.g. waterfowl harvesting). However, these activities take place in an already active mining area. The cumulative effects of future potential projects, could impact the timing of subsistence and traditional activities in the RSA. The timing of cumulative effects is therefore considered moderate (Value of 2).

Spatial Extent

The spatial extent is site specific because the Howse Project and surrounding project activities will impact a limited portion of the RSA (Value of 1).

Duration

The duration of the effect will be long since effects will minimally be felt throughout the lifespan of the Project (Value of 3).

Reversibility

The effect will be partially reversible considering that a partial restoration to pre-development situation is likely. Roads built in the context of mining projects will also continue to be used by locals even after the end of operations (Value of 2).

Magnitude

The magnitude of the effect will be low since it affects a small proportion (<5%) of the population in the RSA and considering that alternative access to the territory will be available (bypass road). The magnitude of the effects of the Howse project (one pit) is also negligible, as compared to the rest of the DSO-wide operations and other potentials mining projects in the area (Value of 1).

Frequency

Land users tend to frequent the territory intermittently and seasonally (for example during hunting seasons or on the week-end for recreational purposes) and for a short periods of time (round trips in a single day). The frequency of the effect has been considered intermittent (Value of 2).

8.10.4.1 Significance

The cumulative residual effects of the Howse Project on subsidence and traditional activities is expected to be non-significant (value of 11).

Likelihood

There is a high likelihood that projects will be developed in Schefferville area in the future due to its location on the Labrador Through.

8.10.5 Follow up and Monitoring Programs

In addition to the monitoring measures in place for the Howse project (Chapter 9), HML is involved in various working groups, including its Community HSE Committee, Regional Steering Committee on Mining Issues, Caribou Ungava, and the Labrador West Regional Task Force, whose mandates include monitoring and addressing cumulative effects.