Pit dewatering rate estimates have not yet been developed for Redmond 2B therefore an evaluation of how this rate compares to the flow range measured in the stream cannot be made at this time. This work will be conducted prior to the commencement of work in this area.

4.1.6 Ambient Water Quality

4.1.6.1 Groundwater Quality

Well Installation and Sampling Methodology

A total of twenty seven groundwater monitoring wells were installed at eight well nest locations at the James Property and six wells at three well nest locations were installed at the Redmond Property (Figure 4.13 and Figure 4.14).

Samples were collected in laboratory supplied bottles. Filtered and unfiltered samples were collected for dissolved and total metals analyses. The filtered samples were filtered in the field using in-line 0.45 micron dedicated Water filters. The samples were shipped to ALS Laboratory Group in Kitchener, Ontario where they underwent analyses for metals and general chemistry.

Groundwater samples were also collected from the pumping wells during the two pumping tests that were conducted at the James Property. These samples were collected using submersible pumps.

Results

James Property

The groundwater chemistry results for the James Property wells have been summarized in Appendix J. For the unfiltered samples the Total Suspended Solids concentrations ranged from 270 to 67000 mg/L and the Total Dissolved Solids concentrations ranged between <20 and 1800 mg/L. The water is quite soft, ranging from 8 to 78 mg/L as $CaCO_3$. As there are no CWQG for dissolved metals, the dissolved metals sample results have been discussed in context of the total metal guidelines presented in the CWQG.

Total Metals

The total iron results for the unfiltered samples ranged between <0.05 and 130 mg/L. The only other metals that were consistently detected in the unfiltered samples were aluminum (range of <0.01 and 61.9 mg/L), cobalt (<0.005 to 0.08 mg/L), copper (<0.001 to 0.08 mg/L), manganese (range of 0.002 to 37.4 mg/L), titanium (<0.002 and 0.3 mg/L), vanadium (range of <0.001 and 0.07 mg/L) and zinc (0.007 and 0.77 mg/L). The results were compared to the Canadian Water Quality Guidelines for Freshwater Aquatic Life (CWQG). At most well locations total iron exceeded the CWQG of 0.3 mg/L, copper exceeded the CWQG of 0.002 mg/L, and zinc exceeded the CWQG of 0.03 mg/L.

Dissolved Metals

The dissolved iron results were all below detection limit with the exception of wells JA-MW5C (0.48 mg/L) and JA-MW7B (0.08 mg/L). The aluminum results were below detection limit except at well JA-MW1-A1 (0.08 mg/L), copper ranged from <0.001 mg/L to 0.004 mg/L, manganese ranged from 0.001 to 0.101 mg/L, and zinc ranged between 0.003 and 0.123 mg/L. Dissolved iron did not exceed the CWQG at any well locations at the James Property. Dissolved copper exceeded the CWQG of

0.002 mg/L in 11 of the 30 groundwater samples collected from monitoring wells at the James Property. Dissolved zinc exceeded the CWQG of 0.03 in 8 of the 30 samples collected from the monitoring wells.

The dissolved metals results were consistently considerably lower than the total metals results.

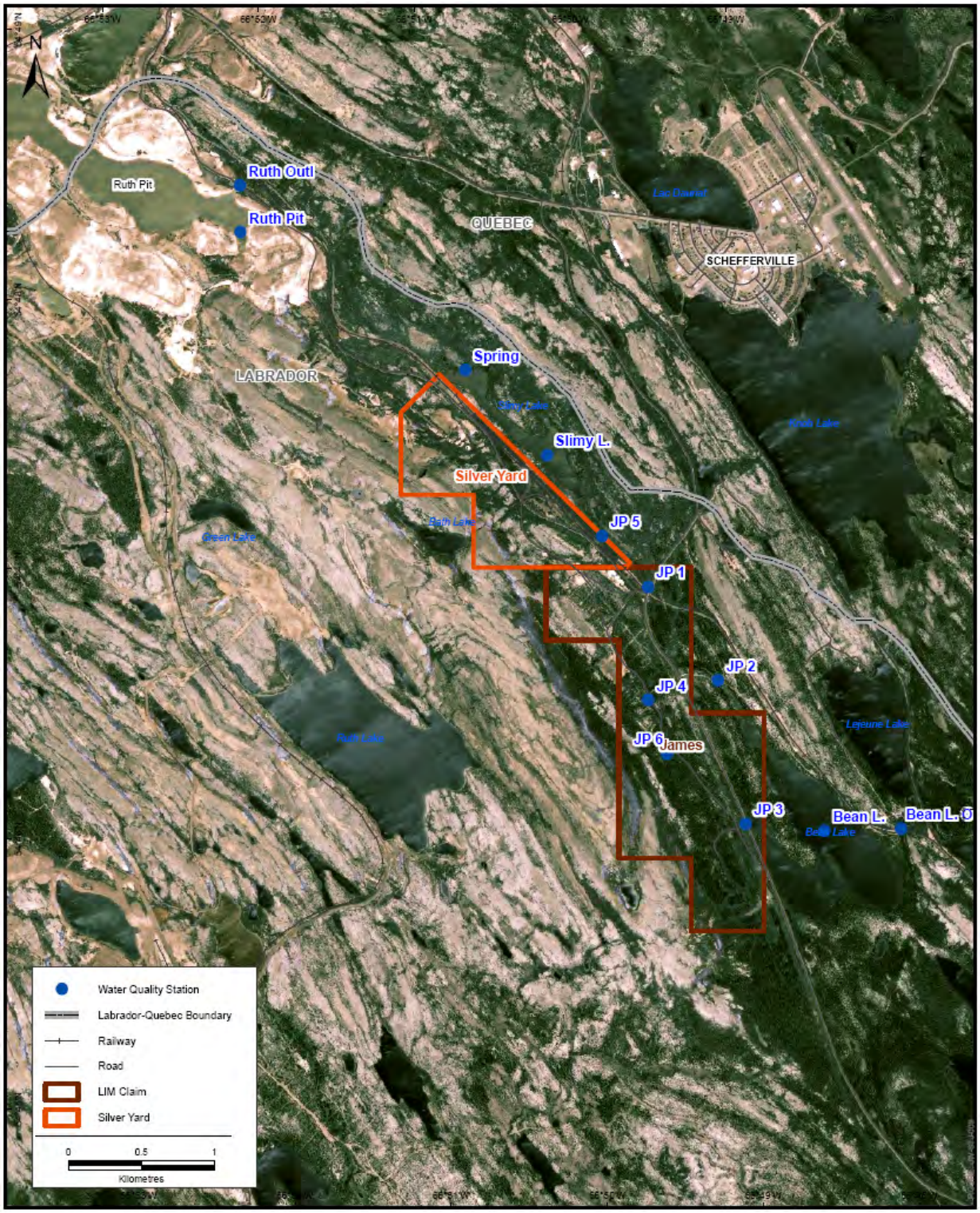


Figure 4.13 Surface Water Sampling Stations, James

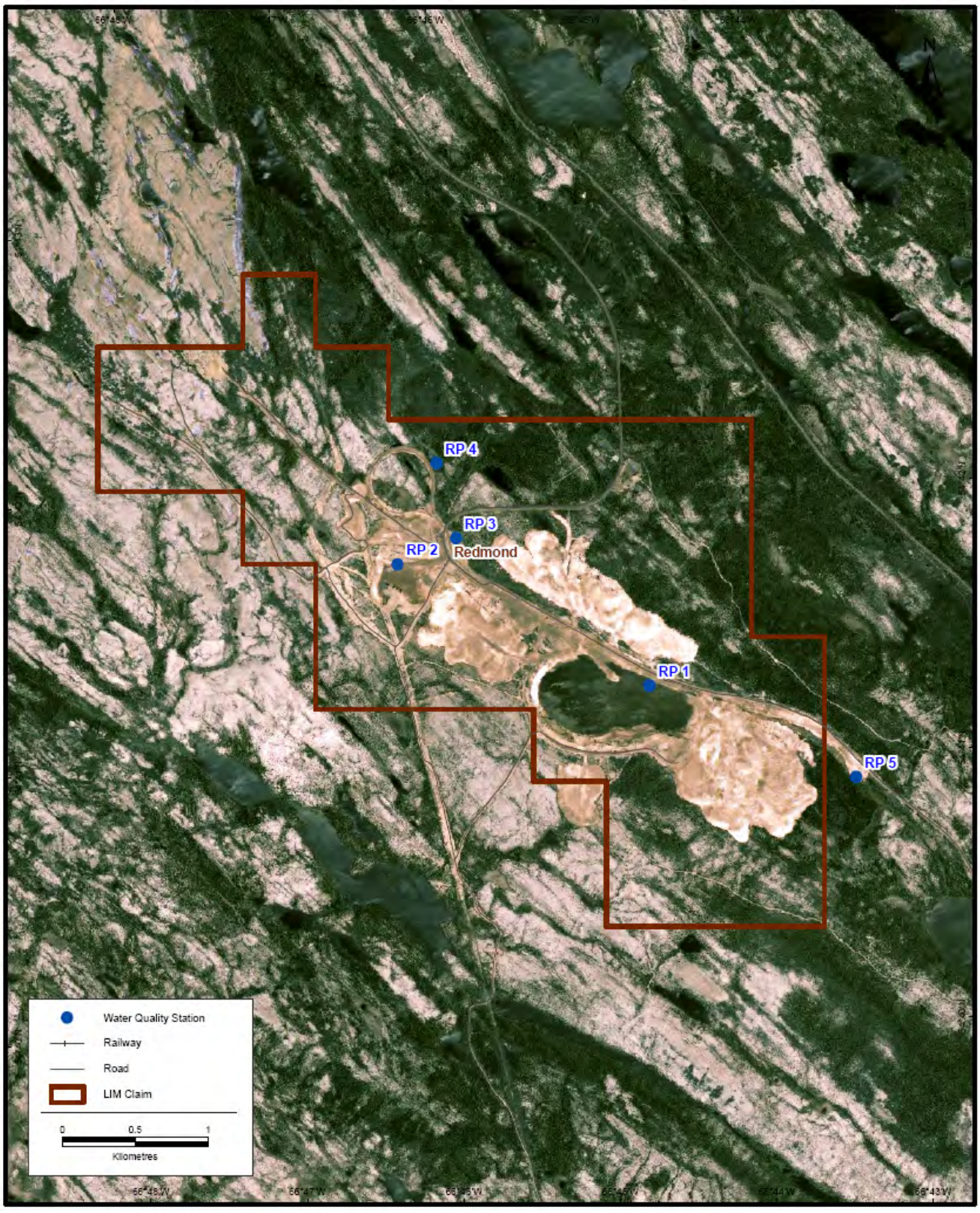


Figure 4.14 Surface Water Sampling Stations, Redmond

Pumping Wells Water Chemistry

Pumping tests were conducted on pumping wells that were installed southeast of the James North Spring. Water quality from the pumping wells is considered to be more representative of water quality to be expected initially from the dewatering system than individual monitoring well results because the pumping wells draw water from a larger portion of the aquifer than do individual monitoring wells. Total and dissolved metals and general chemistry samples were collected from the pumping wells.

The groundwater chemistry results for the pumping tests that were conducted at the James Property were generally similar to the average groundwater monitoring well with respect to parameters detected and their concentrations. The total iron concentrations in the water from the pumping wells ranged from <0.05 to 1.8 mg/L, the total copper concentrations were between <0.001 and 0.017 mg/L, and the total zinc concentrations were between 0.01 and 0.039 mg/L. The water from the pumping wells did not contain detectable dissolved iron or copper. The dissolved zinc concentrations in the pumped water ranged from 0.004 to 0.007 mg/L, and were well below the CWQG of 0.03 mg/L.

The water purged and sampled from each monitoring well and pumped from the pumping wells during the pumping test was brownish red in colour. This reddish colour in the water was present over the duration of the pumping tests. Discussions with a former Iron Ore Company of Canada (IOC) employee who was involved with dewatering work when IOC was operating mines in the Schefferville area have revealed that water from the IOC dewatering wells would commonly be red when the dewatering wells were first installed and started pumping, but that the water would normally clear up after several weeks of pumping (D. Hindy, pers. com.). It is possible that this will also occur with dewatering of the proposed future James and Redmond 2B pits.

Redmond Property

The groundwater chemistry results for the monitoring wells installed at the Redmond property can be found in Appendix J. The Total Suspended Solids results for the unfiltered samples ranged between 11000 and 27000 mg/L. The Total Dissolved Solids results ranged from 30 to 450 mg/L. The hardness levels ranged between 14 and 65 mg/L ($CaCO_3$).

Total Metals:

The total iron results ranged from <0.05 to 212 mg/L. Aluminum ranged between <0.01 and 43.8 mg/L. The results for cobalt were between <0.0005 and 0.232 mg/L. Copper ranged from <0.001 to 0.38 mg/L. The manganese concentrations were between 0.005 and 45.7 mg/L, and zinc ranged between 0.018 and 1.14 mg/L. At most well locations total iron exceeded the CWQG of 0.3 mg/L, copper exceeded the CWQG of 0.002 mg/L, and zinc exceeded the CWQG of 0.03 mg/L.

Dissolved iron was only detected at one well (Red-MW3B at 0.07 mg/L). Aluminum was detected only at RED-MW3A and 3B (0.02 and 0.07 mg/L respectively), manganese ranged from <0.001 to 0.017 mg/L, and the zinc concentrations were between 0.004 to 0.083 mg/L.

Dissolved Metals

The dissolved metals concentrations in the wells at Redmond were consistently lower than the total metals concentrations. The concentrations of TSS and total and dissolved metals tended to be higher in water collected from groundwater monitoring wells at Redmond than at the James monitoring wells.

Surface Water Quality

Surface water sampling followed the protocols outline in Environment Canada's *Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring, June 2002*

Results of surface water samples collected by AECOM in the Redmond and James properties in 2007 and 2008 were compared with the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG, FWAL) and the Guidelines for Canadian Drinking Water Quality (GCDWQ). In general the results for the Redmond property (Appendix J), James property (Appendix J), and offsite areas adjacent to James were consistent with the good water quality reported by LIM from baseline data collected seasonally since 2005.

Redmond Property

Sampling from the 2005 and 2006 Redmond Property are general in nature, as specific sampling locations. Screening water quality testing (2 locations) within the property an ephemeral pond and RP2 (described below). Screening results indicated that surface water quality is very good: pH approximately neutral, alkalinity and hardness were very low, electrical conductivity was also very low (11 – 36 µS/cm), with TDS very low (5 – 18 ppm), as well.

For the five samples locations on the Redmond property (Figure 4.14), a total of 20 surface water quality samples have been collected since April, 2006. Of these samples, all surface water results generally meet CWQG, FWAL and the GCDWQ, with the following exceptions:

RP2

The pH value of 6.46 recorded in the pit in April 2007 was marginally below 6.5, the CWQG, FWAL pH guideline value. Of a total of ten samples, the remaining nine pH recorded values were all within the applicable pH range. It is noted that the lab report provides pH to two decimal points as compared to the CWQG, FWAL, which reports to one decimal place. In consideration of this, the result is approximately the same as the lower end of the acceptable CWQG, FWAL range. Water in the pit is dilute with a total dissolved solids value of 12 mg/L and alkalinity results less than the detection limit of 5 mg/L.

RP3, RP4, RP5

Iron and manganese results in April and March 2007 and 2008 at RP3, RP4 and RP5 were elevated up to 60 times the GCDWQ and CWQG, FWAL. In September, these results return to within acceptable guidelines. Therefore, this pattern suggests a seasonally dependent variation consistent with anoxic conditions that frequently develop under ice cover in late winter in small shallow ponds in many shield locations. Based on general limnological documentation, iron in sediments has been observed to go back into solution under anoxic conditions to levels even more elevated than those observed here. Under ice free conditions, iron and manganese rapidly oxidize and precipitate, leaving iron concentrations in water well within GCDWQ guideline of 300 ug/L. This is observed in the September sampling episodes. For example iron concentrations of 5800 ug/L at RP4 in April 2007 were reduced to 70 ug/L in September of the same year. Similarly, manganese concentrations at RP3 of 780 ug/L observed in March 2007 were reduced to 10 ug/L in September, well below the GCDWQ guideline of 50 ug/L.

RP3 and RP4

Colour, an aesthetic parameter, was reported at RP3 at levels at or exceeding the GCDWQ guideline during the April and September 2007 sampling episodes. This location, at the culvert, could not be accessed during the Spring 2008 sampling program and therefore, 2008 values have not yet been recorded.

Colour at RP4 exceeded the GCDWQ guideline in April 2008 but was within acceptable limits in April 2007 and September 2007.

These exceedences also appear to be associated with seasonal variation.

RP5

It should also be noted that a total zinc concentration of 153 ug/L was noted for RP5 in March 2008. The dissolved zinc value for the same sample was reported as <3 ug/L. This was the first sample collected at this location and additional samples, as well as duplicates, will be collected seasonally to verify the viability of the total zinc result.

Manganese was also noted a 111 ug/L, exceeding the GCDWQ guideline of 50 ug/L. It should be noted the JP5 is in an exposed area conveying flows over historic stockpile of low grade iron ore.

James Property

Sampling sites for the James deposit (Figure 4.13) are situated as follows:

- JP1: In James Creek, located under the main road to Redmond Property;
- JP5: Located adjacent to Silver Yard on James Creek. Also located upstream of JP1;
- JP 2: James Creek prior to discharge into Bean Lake;
- JP3: Unnamed tributary. Culvert at the road at southern edge of James property;
- JP4: Spring that discharges to JP3; and,
- JP6: Spring that merges with JP4 and discharges to JP3.

Of the 19 surface samples collected on the James property, all were within the applicable referenced guidelines with the following summarized exceptions:

JP4, JP5

Zinc concentrations in surface water samples collected in late winter, 2008, at JP4 and JP5 sites exceeded CWQG, FWAL guideline of 30 ug/L. These variances suggest a seasonal variability, e.g. zinc concentrations were elevated in March and April 2008 at sites JP4 and JP5 in comparison to 2007 values, which were below the applicable guidelines.

Offsite Upgradient Samples

In addition to the samples listed above, additional samples were collected offsite at upgradient locations to observe nearby background concentrations near but off of LIM's James property. The following summarizes the sampling locations (Figure 4.13):

- Slimy 1: Spring adjacent to Slimy Lake, Located 1.5 km upstream from JP5 and is headwater lake for James Creek;

- Slimy Lake: adjacent to the Silver Yard area;
- Bean L. Out: Outlet for Bean Lake and encompasses the entire watershed for the James and Silver Yard locations;
- Bean: Located in Bean Lake adjacent to James property;
- Ruth Out: Origin of James Creek and located approximately 4 km upstream from JP5; and
- Ruth Pit: Surface water samples from proposed processing water supply and reject line from Silver Yard Benefaction area.

The following summarizes the exceedances of the applicable guidelines at the offsite sampling locations:

- Slimy 1 and Bean:

Zinc concentrations in surface water samples collected in late winter, 2008, at Slimy 1 and Bean Lake sites exceeded CWQG, FWAL guideline of 30 ug/L. The spring at Slimy appears to indicate bedrock mineral characteristics, with exceedances for aluminum and manganese also being noted. Aluminum returning to acceptable CWQG FWAL before station JP5, but zinc and manganese remained elevated until Bean Lake Variances suggest a seasonal variability base on continual monitoring of Bean Lake, but Slimy 1 spring appears to maintain a higher level of zinc than other surface water features associated with the Project.

4.2 Biological Environment

4.2.1 Wetlands and Flora

4.2.1.1 Description of Study Area

James North and James South Properties

Approximately 50 percent of this area has been disturbed due to past mining activities. Two pits are planned at James North and James South that will be established on either side of a spring that divides the two properties.

Redmond Property

More than 90 percent of the Redmond property has been disturbed by past mining activities. Abandoned and flooded pits, a former rail line turnaround, a rail bed, and historic rock stockpiles are present on the property.

Silver Yard

The proposed beneficiation area is to be situated at the Silver Yard, located north of the James North property. Although the former rail spur lines have been removed, linear infrastructure (roads and the spur rail bed) are still present and in good condition. The Project includes the re-establishment of the railway spur along the existing rail spur bed, the placement of a semi-mobile washer and crusher, stockpile areas and a loading area to facilitate transport of ore via rail cars.

4.2.1.2 Methods

Field Sampling

Detailed investigations of the existing on-site natural vegetation communities for all three sites included a comprehensive plant species inventory as well as a description of site and soil conditions.

Vegetation Inventory

Twenty-nine detailed ecological plots were established in the James, Redmond and Silver Yard areas to describe vegetation within the four sites. Plots were located within areas of varying species composition and were described using a combination of aerial photograph interpretation, satellite imagery interpretation, soil profile examinations and multilayer (canopy, sub-canopy, groundcover) vegetation inventories. Soil pits approximately 30-50 cm (depending on geological conditions) were excavated to examine soil profiles at each plot. A vegetation inventory examined a $10m^2$ area around the soil pit. The abundance of individual plant species along with their location within the flora strata was noted.

Vegetation communities were classified and delineated utilizing the following systems: The Canadian Wetland Classification System (National Wetlands Working Group, 1997) and The Canadian Vegetation Classification System (National Vegetation Working Group, 1990).

A hand-held global positioning system (GPS) was used to record the location of all the plots. Representative photographs were taken at each site.

Results

Appendix L presents a floral species list for each vegetation community delineated and representative photographs of each ecological plot.

Climate and Ecological Site Context

The Schefferville region is situated within the Labrador Uplands Ecoprovince, Smallwood Reservoir-Michikamau Ecoregion. The region has a continental, subarctic climate with cool, short summers and long, severe, cold winters. The mean annual temperature is approximately -3.5 ^{o}C; the mean summer temperature is 9 ^{o}C and the mean winter temperature is -16 ^{o}C. Annual precipitation is approximately 1000 mm. The growing season is 100 to 120 days.

Black spruce (*Picea mariana*) is the dominant tree species. White spruce (*Picea glauca*) and tamarack (*Larix laricina*) also occur. Open stands of lichen-spruce woodland with an understory of feathermoss, are dominant. The general aspect of the region is that of a rolling plain with numerous lakes and isolated rugged hills composed of Achaean granites, gneisses and acidic intrusives that occur about 150 m above the general landscape. Humo-Ferric Podzolic soils are dominant with major inclusions of Ferro-Humic Podzols, Mesisols, and Organic Cryosols.

James Property

The James site is situated within a valley between two parallel ridges trending northwest to southeast. Former mining operations for this property ceased in 1982. Since then, disturbed areas have been left to re-vegetate resulting in alternating communities of spruce forest and birch/alder/spruce forest particularly along the northeastern flank of the most southwesterly ridge.

Eight communities were observed within the James property. Vegetation is typical of the varying land classes encountered in the area. The predominant tree species is black spruce, white spruce, and tamarack with various mixed stands of birch (*Betula spp*.). Ground vegetation is consistent with the typical biophysical land classes associated with spruce-moss, spruce-shrub and open lichen forests. The shrub layer consists mostly of birch (*Betula pumila*), willow (*Salix spp*.) and alder (*Alnus spp*.). Some sedge-dominant wetland pockets also occur where surface drainage is poor.

Vegetation Communities

Intermediate, closed deciduous shrub stand dominated by birch species - is one of the major vegetation communities within the study area. It covers the gentle to moderately steep slopes of the ridges as well as the lower parts of the slopes. The community is dominated 80 percent by shrub species including dwarf birch and green alder (*Alnus viridis ssp. crispa*). Tree cover is sparse and consists of black spruce. Ground cover, comprised mainly of bunchberry (*Cornus canadensis*), with some mosses and lichens, is also sparse covering approximately 5 percent of the ground. This vegetation community is not located within the Project footprint.

Intermediate, open deciduous tree stand dominated by black spruce - is located on the low and moderate slopes of the ridges and dominated by intermediate trees with tall and low shrubs. The tall shrub layer consists of dwarf birch; the low shrub species are lowbush blueberry (*Vaccinium angustifolium*), black crowberry (*Empetrum nigrum.*) and redberry (*Vaccinium vitis-idea*). Tree cover is 40-60 percent and consists of black spruce (*Picea mariana*). Groundcover is sparse (5 percent), dominated by aster (*Aster sp.*) and willowherb (*Epilobium sp.*). This vegetation community is partially within the Project footprint.

Low, closed herb graminoid stand dominated by sedge species – is a fen that can be characterized as moderately rich with slightly higher concentrations of dissolved minerals and dominated by sedges and brown moss. Sedge species dominate the sub-stratum (95 percent) and willow/berry bearing shrubs constitute the low-lying canopy on elevated hummocks. Tree cover is less than 5 percent and consists of stunted spruce and tamarack trees on hummocks. Organic soils occur up to 30 centimetres deep consisting of slightly decomposed roots of sedges, grass and moss. Dominant species include water sedge (*Carex aquatilis*); willow shrubs (*Salix sp.*), buckbean (*Menyanthes trifoliata*), leatherleaf (*Chamaedaphne calyculata*), redberry (*Vaccinium vitis-idea*) and black crowberry (*Empetrum nigrum.*). This community is within the Project footprint.

Low, closed herb graminoid stand dominated by sedge species – is a fen located in a local depression that receives most of the water from direct precipitation and runoff from the slopes. The fen has an outflow stream on the west side. Sedge species dominate the sub-stratum and *Sphagnum* mosses constitute the ground cover. Shrub cover is less than 5 percent and consists of three species of willow (*Salix sp.*). Organic soils are up to 20 centimetres deep consisting of slightly decomposed roots of sedges and leaves. Sedge species are predominated by water sedge (*Carex aquatilis*); wildflower species include buckbean (*Menyanthes trifoliata*) and silverweed (*Potentilla palustris*). The vegetation community is within the Project footprint.

Intermediate, open deciduous stand dominated by birch species - is an example of the regeneration of previous forest harvesting, which occurred approximately 25-30 years ago. The tree cover is approximately 40 percent and consists of mountain paper birch (*Betula papyrifera*), resin birch (*Betula glandulosa*) and black spruce. The high shrub layer includes dwarf birch and green Alder (*Alnus viridis ssp. crispa*); the low shrub species are Labrador tea (*Ledum groenlandicum*), lowbush

blueberry, bog bilberry (*Vaccinium uliginosum*), black crowberry and redberry. Groundcover is sparse to non-existent. This community is partially within the Project footprint.

Tall, closed deciduous shrub stand dominated by green alder - is typical along the access roads and distributed in narrow strips (3-5 m in width). This vegetation is also associated with recently (5-7 years) disturbed areas such as exposed till. The community is dominated strictly by green alder. The tree cover is sparse (5 percent) and consists of black spruce and mountain paper birch. The ground cover consists of bare ground and rocks. This community is partially within the Project footprint.

Tall, closed coniferous forest dominated by black spruce with mosses – occurs at lower parts of the slopes with limited drainage. The community is dominated 70 percent by tree species black spruce (90 percent) and white spruce (10 percent). Shrub cover is 10 percent and consists of birch, Labrador tea, lowbush blueberry, bog bilberry and black crowberry. Groundcover is relatively dense (25-30 percent) and dominated by bunchberry, twinflower (*Linnaea borealis*) and wood cranesbill (*Geranium sylvaticum*). This community is within the Project footprint.

Tall, open coniferous forest dominated by black spruce with birch associates – is prevalent on drier parts of lower and medium gentle slopes with better drainage. This community is dominated by tree and shrub species. Tree cover is 50 percent and includes black spruce and white spruce. Shrub cover on the plot is about 40-50 percent and the dominant plants are dwarf birch, Labrador tea, black crowberry, lowbush blueberry and bog bilberry. Ground cover is sparse and dominated by bunchberry. This community is partially within the Project footprint.

Open, nonvascular lichen stand – occurs along the highest points of the ridges. It is dominated by lichen species and exposed rock. This community is outside the Project footprint.

Silver Yard

The Silver Yard property is similar to the Redmond site as it has numerous service roads. The service roads, with a north-south orientation, are extensively bordered with alder and willow regeneration. The Silver Yard is within a large valley bordered on the east by a talus slope forested at the base, and to the west, by another slope heavily covered with spruce at the base thinning to almost no vegetation near the summit.

Vegetation Communities

Low, closed deciduous shrub stand dominated by birch species - is dominated by shrub species (80-90 percent cover) that include dwarf birch and Labrador tea. Tree cover is sparse and consists of black spruce. Groundcover is also sparse (5-10 percent), dominated by bunchberry. The site has a north-easterly aspect and a slope of 9°(20 percent). This community is partially within the Project footprint.

Intermediate, closed deciduous shrub stand dominated by alder species – is prevalent on recently disturbed exposed till surfaces and is dominated by green alder. Other shrubs include dwarf birch, bog bilberry willows. The tree cover is sparse (<5 percent) and consists of black spruce. The ground cover is sparse and consists of grasses (<5 percent) and mosses and lichens. Bare ground and rocks occur over approximately 50 percent of the plot. This community is partially within the Project footprint

Intermediate, closed deciduous shrub stand dominated by birch species – is located along the western lakeshore of Slimy Lake and is dominated by shrub species. These include dwarf birch, willow and skunk currant (*Ribes glandulosum*). Trees are absent. Ground cover is approximately 40 percent

and it is dominated by horsetail (*Equisetum sp.*), Aster (*Aster sp*.) and yarrow (*Achillea millefolium*). This community is partially within the Project footprint.

Redmond Property

The Redmond site has a wide range of habitat types, largely due to the presence of former mine and pit operation. The habitats range from completely bare ore piles and service roads, to heavily blanketed areas with alder and willow thickets. This area also has a large, flooded pit in the southwest corner of the site. The undisturbed areas are mostly mature black spruce at lower elevations, with stunted spruce – lichen stands along the ridge summits.

Vegetation Communities

Low, sparse deciduous shrub stand dominated by crowberry with lichen patches - is the main vegetation community that is widely distributed on the top of ridges. It covers approximately 100 percent of this area along with the lichen-shrub dominated stands. There is approximately 60-70 percent exposed bedrock that includes granite/gneiss. Low-lying shrub species cover approximately 15 percent of the area and consist of black crowberry, bog bilberry, dwarf birch, net-veined willow (*Salix reticulata*), and redberry. Lichen species represent 10 percent of vegetative cover in this community. This community is partially within the Project footprint.

Low, open deciduous shrub stand dominated by crowberry and lichen species – is located on steeper slopes and hilltops. The community is dominated by lichen species and shrubs. Lichen species include coral lichen (*Cladina stellaria*) and reindeer lichen (*Cladina rangiferina*). Total cover of lichens is 95-100 percent. The shrub canopy is dominated by black crowberry, dwarf birch, Labrador tea and redberry. This community is partially within the Project footprint.

Intermediate, closed deciduous shrub stand dominated by green alder and a variety of herbaceous plants – is located in the narrow valley between two hills. The community is dominated by shrub species. Total shrub cover is 90 percent. Species observed include green alder, dwarf birch, willow and skunk currant. Groundcover is approximately 15 percent and is dominated by bunchberry, wood cranesbill, aster and violet. The dominant moss species is red-stemmed feathermoss (*Pleurozium schreberi)*. This community is partially within the Project footprint

Intermediate, open deciduous shrub stand dominated by birch and sphagnum moss – is located in a depression that collects water to form a fen that is flat to slightly concave. Sedge species dominate the sub-stratum (75-80 percent) and sphagnum mosses constitute 95 percent the ground layer. The dominant species of sedge is beaked sedge (*Carex rostrata*); wildflower species include buckbean (*Menyanthes trifoliata*). Shrub cover is about 30 percent and consists of dwarf birch and two species of willow (*Salix sp.*). Organic soils up to 20 centimetres deep consist of slightly decomposed sphagnum moss. This community is outside the Project footprint.

Tall, open coniferous tree stand dominated by tamarack, polytrichum and sphagnum moss – is situated on the edge of the fen (described above) and forms the transition zone between the slopes and the bottom of the depression. This community is dominated by shrubs and trees. The tree species include black spruce and tamarack. The shrub canopy is dominated by dwarf birch, Labrador tea bog bilberry and bog rosemary (*Andromeda polifolia*). Moss cover is dense and consists of haircap moss (*Polytrichum sp.*) and sphagnum moss (*Sphagnum sp.*). Ground cover is sparse (5 percent), with bunchberry, willow herb (*Epilobium sp*.) and grasses. This community is outside the Project footprint.

Tall, closed coniferous tree stand dominated by white spruce - is dominated by shrubs and trees. The tree layer is entirely white spruce while the shrub layer is dominated by dwarf birch, Labrador tea and lowbush blueberry. Moss and lichen cover are relatively dense and consist of red-stemmed feathermoss and star-tipped reindeer lichen (*Cladina stellaris*). Groundcover is sparse, and dominated by bunchberry and grasses. This community is outside the Project footprint.

Low, closed herbaceous graminoid stand dominated by sedge species – is located between the access road and the stream on the riparian zone of the stream. Sedge and grass species dominate the sub-stratum (90 percent) and willow shrubs constitute the canopy. Moss cover represents less than 10 percent of the plot. Open water constitutes 10-15 percent of the plot. Organic soils occur up to 20 cm deep consisting of slightly decomposed roots of sedges, grass and silty clay (from the road). This community is outside the Project footprint.

Northern Ribbed Fen – is located in the narrow valley between the ridges. This community is dominated by low shrubs and sphagnum mosses. The tree species include stunted forms of black spruce and tamarack. The shrub canopy is dominated by leatherleaf (*Chamaedaphne calyculata*), cloudberry (*Rubus chamaemorus*), dwarf birch and Labrador tea. The sphagnum cover is dense. The wildflower species include buckbean. Organic soils occur up to 50 centimetres deep consisting of black to dark brown peat. This community is outside the Project footprint.

Northern Ribbed Fen – hollow/shallow pools – Sedge species dominate the sub-stratum (10-60 percent). The rest of the site consists of open water. Wildflower species include buckbean, cottongrass (*Eriophorum sp.*), leatherleaf and three-leaved false soloman's seal (*Maianthemum trifolium*). Organic soils up to 40 centimetres deep consist of highly decomposed sphagnum moss. This community is outside the Project footprint.

Rare Plant Species

Based on recent fieldwork conducted by AECOM and a search of the Atlantic Canada Conservation Data Centre (AC CDC) database, there are no known occurrences of plant species listed under the federal *Species At Risk Act* or the Provincial *Endangered Species Act* within the Project footprint.

4.2.1.3 Wetlands

James Property

The James property has a total of five hectares of wetlands within the defined footprint area (area of proposed surface disturbance). Approximately 4.7 hectares of wetland (three discrete areas) is comprised of willow/tamarack and sedges. One wetland, between the two pits, is dominated by low, closed herbaceous sedges covers the remaining 0.3 ha of wetland within the footprint area. Where feasible, LIM will limit disturbance to these wetlands through provisions in the EPP and ongoing environmental planning.

Redmond Property

There are no identified wetlands within the proposed footprint area.

Silver Yard Area

There are no identified wetlands within the Silver Yard footprint area.

4.2.2 Wildlife

4.2.2.1 Caribou

Labrador's caribou can be classified into two main groups, the migratory and sedentary ecotypes, which are distinguished by their use of calving grounds or fidelity to specific calving sites. Migratory caribou travel large distances, occupy large home ranges, and aggregate during calving periods. Conversely, sedentary caribou display limited movements, occupy smaller home ranges, and tend to disperse during the calving period (Schaefer *et al.* 2000; Bergerud et al. 2008).

The Project occupies a portion of Western Labrador which overlaps with the range of the George River Caribou (GRC) Herd. Straddling the Quebec-Labrador peninsula, the GRC Herd is one of the world's largest *Rangifer* populations, with population estimates peaking at almost 800,000 individuals in the 1980's (Couturier *et al. 1*996; Russell *et al. 1*996, Rivest *et al. 1*998). This area of western Labrador overlaps the GRC Herd as a portion of their winter range (Jacobs 1996). Although there is no evidence of sedentary caribou herds existing here at present, they were reported historically (e.g. Caniapiscau or McPhayden Herds) (LWCRT 2005, Bergerud et al. 2008). The sedentary herds of this region have declined or disappeared since the 1960s with the advent of the snowmobile and expanded transportation network allowing greater access. The sedentary herds of this region have declined or disappeared since the 1960s with the advent of the snowmobile and expanded transportation network allowing greater access. The migratory and sedentary caribou inhabiting the Ungava peninsula (i.e., Labrador and northeastern Quebec) are, and historically have been, an integral component of the way of life for aboriginal and non-aboriginal people for many centuries (Schmelzer and Otto 2003; Loring 2008).

In addition to the GRC Herd, there is another migratory ecotype that is recognized on the Ungava Peninsula and known as the Rivière-aux-Feuilles ('Leaf River') (RAF) Herd. Existing sedentary populations include the Lac Joseph (LJ) Herd located south of the Assessment Area, and the Red Wine Mountains (RWM), the Joir River (JR), and the Mealy Mountains (MM) Herds all much further to the east. The Mealy Mountains act as a geographic barrier separating this herd from the other herds of Labrador, but the lack of a geographic barrier between the other three sedentary herds results in an overlap of herd ranges (Schmelzer *et al.* 2004; Bergerud et al. 2008). Schmelzer *et al.* (2004) indicates that during the winter months, the George River Caribou Herd encounters the outer limits of their ranges providing the opportunity for the intermingling of animals. The proposed site of the Project occurs entirely within the range of the GRC Herd.

Assessment Boundaries

Spatial and Temporal

Temporal boundaries for the GRC Caribou Herd effects assessment comprise four timeframes: existing environment, construction phase (approximately six months), operation phase (approximately 5 years), and decommissioning phase (post-operation phase).

The range of the GRCH occupies over 800,000 km^2 in Labrador and Northern Quebec. Caribou from this herd travel large distances over the Quebec-Labrador peninsula and aggregate on traditional calving grounds each June demonstrating strong site fidelity (i.e., returning to similar locations annually) (Schmelzer and Otto 2003). The GRCH has been known to rut and overwinter in this area, but there is no evidence supporting any calving activities in the Assessment Area. The nearest sedentary herd

known to exist is the Lac Joseph Herd, located south of the Project Area, and not believed to interact with the Project.

Administrative and Technical

The regulatory requirements and jurisdictional or planning programs that apply to the management of different species are referred to as administrative boundaries. This includes the listing of species by federal or provincial legislation and designations by COSEWIC, the Committee on the Status of Endangered Wildlife in Canada who listed the sedentary caribou populations of Labrador as "Threatened" (COSEWIC 2008, SARA 2008). Hunting of sedentary herds is illegal; however, the hunting of the migratory GRCH is legal within the seasons (August 10-April 30) and quotas for George River are defined by the provincial government (NLDEC 2008).

Although field work has not been conducted for this Project, there is sufficient information available on the migratory and sedentary caribou populations of the area to assess the potential interactions and environmental effects of the Project on the GRCH.

Assessment Area

The caribou Assessment Area is delineated by a 100 km^2 grid block represented in Figure 4.15. This area includes an approximately 50 km area around the LIM claim areas of James North and James South, as well as the Redmond Mine Area where the initial mining will take place.

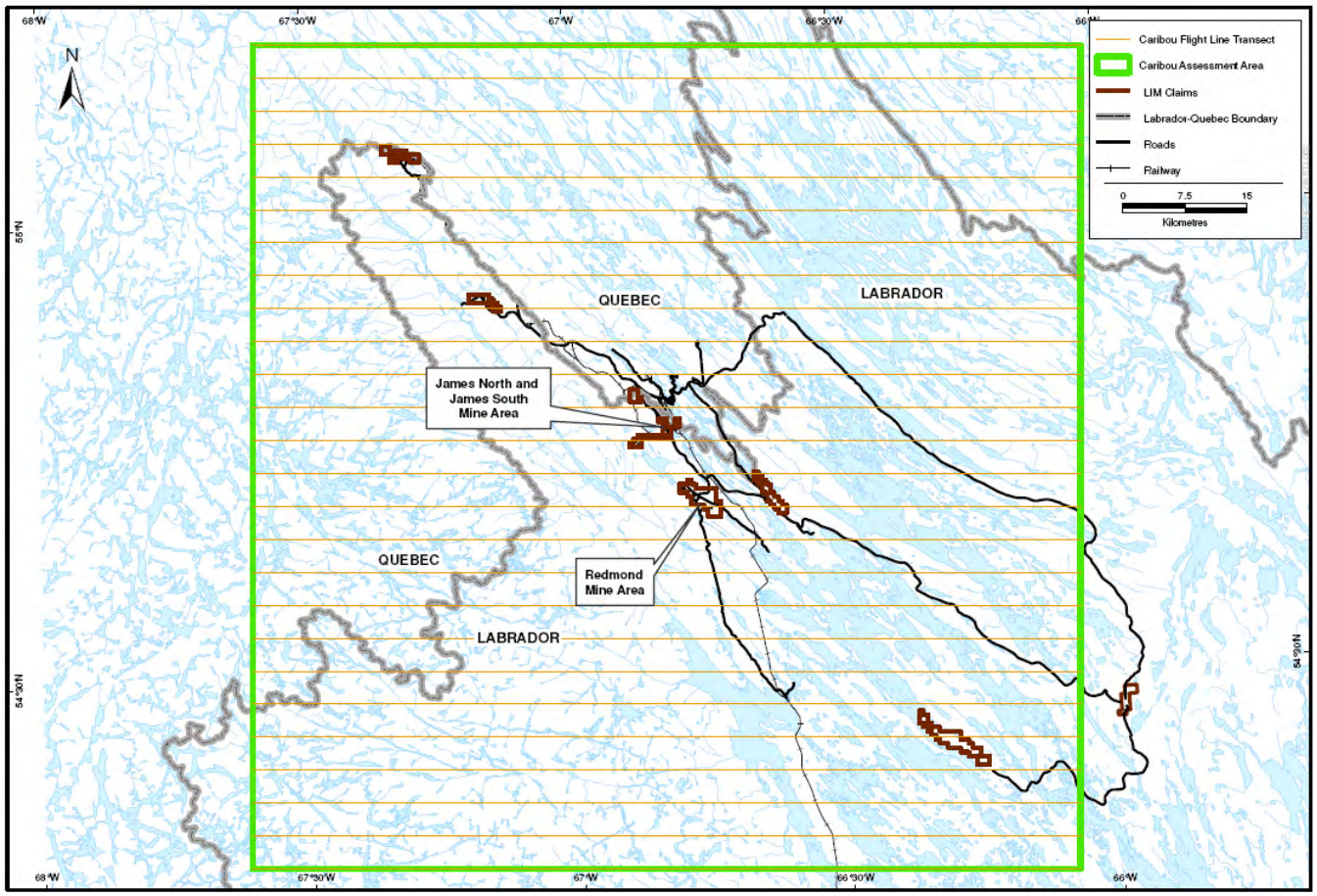


Figure 4.15 Caribou Assessment Area

Sources of Information

Government documents, peer-reviewed literature, and technical reports were examined for relevant information on caribou in Labrador and north-eastern Quebec, focusing on the Assessment Area. The Study Team consulted Provincial Wildlife Division personnel in Labrador City, Happy Valley-Goose Bay, and Corner Brook, and representatives attended the 12th North American Caribou Workshop held in Happy Valley-Goose Bay. Local Aboriginal and non-Aboriginal groups were consulted and observations of wildlife and caribou were tracked during field studies. Any caribou issues within the Project area have been monitored by a LIM representative. In addition, LIM has conducted a public meeting with the Quebec Innu (Montagnais) to acquire traditional knowledge and presented caribou and other wildlife presence on drawings (August 2008). At the same time, a meeting was held with the Naskapi to present this traditional knowledge and to request their input about caribou and the natural environment.

Existing Environment

The caribou herds that occur across Labrador and northeastern Quebec occur within three large vegetation biomes. The taiga, in the southernmost portion of caribou range, is characterized by black spruce (*Picea mariana*), jack pine (*Pinus divaricata*), larch (*Larix laricina*) and terrestrial lichens, grading northward to become forest tundra, which is sparsely populated by stunted black spruce and larch (Courtier *et, al.*1990). The tree line, which stretches from east to west along 58°N latitude in Quebec and north of 56°N latitude in the elevated Labrador plateau (Hearn *et al.* 1990), delineates the transition from forest tundra to arctic tundra. The absence of trees and the presence of a lichen carpet with sparse thickets of stunted *ericaceous* plants are common to the arctic tundra (Couturier *et al.* 1990).

LIM operations will occur at the southern edge of the forest tundra, yet reflect extensive surface disturbance from previous mining operations. The baseline report prepared by AECOM (2008) for LIM describes the area as ranging from exposed tundra/exposed bedrock with lichen and sparsely populated trees and low-lying shrubs to low wetlands and boggy areas. Intermediate land classes consist of varied forest types, dominated by spruce-lichen and spruce-moss. The James North and James South properties have been approximately 50 percent disturbed as a result of previous mining activities on the landscape. The James property runs along both sides of an existing road which connects Schefferville to the Redmond property. Sparsely forested parallel ridges and valleys oriented northwest to southeast are typical of the local landscape (AECOM 2008).

Herd Ranges

Schmelzer and Otto (2003) studied the winter range of the GRC Herd and noted that the location of their winter range is unpredictable regarding site fidelity; however, after travelling large distances through the winter over the Quebec-Labrador peninsula, they aggregate on traditional calving grounds (located several hundred kilometres north of the Assessment Area) each June. The annual range of the GRC Herd includes tundra, forest-tundra, and boreal forest habitat and encompasses most of Northern Quebec and Labrador between 55°N and 60°N latitude, from the Labrador Sea to Hudson Bay (Messier *et al.* 1988). There is a 47,000 km^2 tundra area used for calving by the GRC Herd, considered smaller than that of any other large Canadian herds (Bergerud and Luttich 2003).

The Rivière-aux-Feuilles Caribou Herd occupies Northern Quebec only, but their fall and winter range has often over lapped with that of the GRC Herd (Crete *et al.* 1990). The recognized range of the RAF Herd does not include the Assessment Area (CRA 2004). While the GRC Herd has declined in recent years, the RAF Herd has shown an increase, almost doubling in numbers since a census in 1991 at

260,000 and in 2001 at 628,000 individuals (Government of Quebec 2005). Crete *et al.* 1990 state that telemetry data indicates that RAF Caribou calve and spend the summer north of the tree line and partially move south of the tree line in the winter, west of Kuujjuaq (1990). Recent research has suggested that the GRC and RAF Herds overlap in their fall rutting range, resulting in genetic overlap, and may be functioning as a metapopulation (Boulet et al. 2007).

Although the ranges for these migratory herds are known, the specific movements of individuals are unpredictable from year to year (Bergerud and Luttich 2003; Schmelzer and Otto 2003). Within their range, caribou may be present in one location for a given year, but absent the next. This pattern was documented for the GRC Herd by Schmelzer and Otto (2003) who attributed seasonal variation in winter habitat use to an avoidance strategy by the herd.

Examples of sedentary herds in Labrador include ranges of up to 59,000 km^2 for Lac Joseph, 46,000 km^2 for Red Wine Mountains, and 24,000 km^2 for the Mealy Mountain caribou herds (Schmelzer *et al*. 2004). The overlap of these herds (Figure 4.16) is adapted from the Labrador recovery strategy for woodland caribou (Schmelzer *et al*. 2004). The Lac Joseph Caribou Herd is the closest recognized sedentary herd to the Assessment Area, approximately 200 km southeast.

Population Sizes and Trends

Many studies have documented the history of the migratory GRC Herd throughout the Ungava Peninsula and its annual migrations. In the 1950s the GRC Herd was estimated at 10,000 individuals and experienced a rapid increase to over 600,000 by the mid-1980s (Harrington 1996). This growth occurred despite the fact that accessibility to the herd resulted in increasing hunting pressure. Also, road development made travel to the herd easier, opening up more country to hunting (Harrington 1996). The most recent estimate of this herd is 296,000 individuals, based on a post-calving estimate (Couturier *et al.* 2004). The cause of the increase and decrease is a matter of much debate. However, the increase in survival and recruitment through decreased density-dependent natural mortality from wolf predation, and legal and illegal hunting, must have been involved (Hearn *et al.* 1990). Emigration to the increasing Rivière-aux-Feuilles population has also been suggested as a potential cause of the GRC Herd's apparent decline (Boulet et al. 2007).

The sedentary populations in Labrador have been listed as "Threatened" by the Committee on the Status of Endangered Wildlife in Canada since May 2002 (COSEWIC 2008; SARA 2008). Population trends among the herds are mixed as the Red Wine Mountains Herd is showing a decline in number of individuals while the Lac Joseph and Mealy Mountain Herds are indicating stabilization or an increase in number of individuals (Newfoundland and Labrador Inland Fish and Wildlife Division 2005). The George River Caribou Herd and Rivière-aux-Feuilles Herd are not listed as populations of conservation concern provincially or federally.

Figure 4.16 Selected Caribou Herd Ranges, Labrador and Northeast Quebec

Population declines in the sedentary herds have been examined in relation to moose densities, predation by wolves, and other factors such as emigration. Emigration of Red Wine caribou to the GRC Herd may represent the second greatest contributor to loss of radio collared females during the period of decline, although it could not logistically be quantified (Schaefer *at al* 1999). The most recent population estimates of these herds are presented in Table 4.15.

Table 4.15 Population Estimates for Five Herds in Southern Labrador

Caribou Herd	Population Estimate	Year	Population Trend	References
George River	296,000	2001	Declining	Couturier et al. (2004)
Riviere-aux-Feuilles	628,000	2001	Increasing	Couturier et al. (2004)
Lac Joseph	1,101	2000	Increasing	Chubbs *et al.* (2001) , Schmelzer et al (2004)
Red Wine Mountains	87	2003	Declining	Schmelzer et al (2004)
Mealy Mountains	2,585	2002	Increasing	Otto 2002, Schmelzer et al (2004)

Note: Sedentary populations also exist at Joir River and Torngat Mountains in Labrador.

Habitat Use and Preference

For the migratory GRC Herd, habitat can be described as tundra, forest-tundra and boreal forest habitat characteristic of the Boreal and Taiga Shield Ecozones. Habitat use is affected seasonally as the ranges change from winter to summer. Following an increase in herd population, summer habitat is considered spatially limited and alternative summer range is not available (Messier *et al.* 1988). Animals tend to avoid areas grazed during the previous winter and select alternate sites with more abundant lichen cover (Schmelzer and Otto 2003) having a preference for *Cladina* spp. (Cote 1998).

Caribou distribution and seasonal movements are a reflection of food availability in all seasons, insect relief during summer, and calving areas that have a low predator density that improves reproduction and survival of herd members. Disturbances that alter or destroy habitat, or change in habitat effectiveness, may displace caribou to less favourable habitats.

Western Labrador experiences a high amount of snowfall annually, with a precipitation frequency of 67 percent recorded in western Labrador (i.e., Wabush (Environment Canada 2008). Caribou in central Labrador, however, are able to tolerate greater snow depths than most other North American herds (Brown and Theberge 1990). Snow depth affects the ability of caribou to detect (through smell) forage on the ground. In consideration of the extreme snowfall conditions in Labrador, caribou display adaptive feeding strategies. As an example, there is evidence that caribou are capable of distinguishing features to locate forage on the ground despite snow coverage (Brown and Theberge 1990). For sedentary herds, snow cover is a major influence on caribou winter habitat use with animals making greater use of forested areas during years of less snowfall.

Migration Patterns

Winter movements and distribution of the GRC Herd can be attributed to many factors including predation risk and snow cover. Bergerud and Luttich (2003) have observed a pattern that may be driven by predation noting that in years of shallow snow cover, the majority of this Herd moved south of the tree line, but in years of deep snow cover, a large portion of the Herd remained above the tree line (2003). Predation by wolves may be more prevalent during heavy snow years as caribou may be more

susceptible. In an attempt to decrease predation risk, caribou move into wind-swept tundra habitats whereas the opposite can occur in years of lower snow cover (Bergerud and Luttich 2003) when caribou move into forested habitats.

Bergerud and Luttich (2003), in their study of the GRCH from 1958 to 1993, also noted that the GRC Herd generally localized and reduced travel rates in late November or early December as snow cover increased moving into the more restricted winter ranges, which can typically be considered from December to mid-March. They also noted the spring migration to calving grounds occurred from mid-March to April with a mean date of April 8 (Bergerud and Luttich 2003). For at least two decades, the females of this herd have used the plateaus of the George River for calving, occurring around mid-June (Toupin *et al.* 1996). The post-calving or summer range is thought to be regulated by forage limitations (Cote 1998). Typical of sedentary herds, calving locations are dispersed and there is not much consistency or fidelity in year to year site selection.

The GRC Herd may be found in and around the Assessment Area during their spring and fall migrations, fall rut, and through the winter, with their range including most of northern Quebec and Labrador (Boulet et al. 2007). The GRC Herd has gradually shifted its winter range over the years to maximize the availability of forage (Schmelzer and Otto 2003).

Local Hunting and Outfitting

Harvest quotas for the GRC Herd are defined by the NLDEC (2008).

The presence of the GRC Herd in Western Labrador and the Schefferville area during fall and winter (Jacobs 1996; Boulet et al. 2007) has created a regionally important outfitting industry. Because winter presence and size of the herd is unpredictable from year to year (Schmelzer and Otto 2003), hunting outfitters in the Schefferville area have had to adapt to their inconsistent movement patterns and seasonal distribution. One Schefferville outfitter states that caribou in the area are constantly changing their migration patterns, meaning that the success of traditional hunting sites varies annually (and within the season) according to the movements of the animals (Larocco 2008). Changes in the migration pattern of the Quebec-Labrador caribou have also resulted in outfitters moving their hunting sites or having multiple camps in order to provide an efficient hunt for their clients (Bowhunting Canada 2008). Hunting of sedentary herds is illegal; however, the hunting of the migratory GRC Herd is permitted from early August to late April (NLDEC 2008).

4.2.2.2 Other species

Information sources on other wildlife species within the vicinity of the Project include a variety of sources. Interviews with wildlife research and conservation staff with the Wildlife Division, other consultants in the Province, McGill University, the Institute of Environmental Monitoring and Research (IEMR), local trappers, and available literature was supplemented with insight provided by LIM staff and contractors who have been active at this location in recent years. In general, there are few larger wildlife species found in these areas, as the Project is situated on the edge of the tundra and comprises thinning forest communities mixed with open barren habitats.

Black Bear (*Ursus americanus*)

Black Bears are considered common in the LIM Project area although specific estimates are not available (Parr, T. and Porter, C. 27 November 2008). Bear presence has been confirmed northwest of Slimy Lake and southeast of the James Property of the Project area as identified at a trapper's meeting

held 13 August, 2008 in Schefferville. Black Bear are a forest-dwelling animal although they may also use barren, and sea ice habitats during spring. Forest, barrens and river habitats are important during the summer and fall seasons. Bears have been reported occupying open areas, but tend to avoid recent burns (Jacques Whitford 1997). Seasonal habitat selection is usually related to foraging. Although they are the largest predator in the area, their diet mainly consists of plants, fruits, berries, green leaves, and tubers. They are known for their diversity within their diet, ranging from insects and plants to small mammals, dead animals and leftovers from human presence at local landfills or camping sites (http://dnr.wi.gov/org/land/wildlife/PUBL/wlnotebook/bear.htm).

Bears are frequently found in areas of domestic waste disposal where odours attract them and they become nuisance animals and a cause for concern to human safety. Informants indicate that bears have been observed at the Schefferville landfill, approximately 4 km from the LIM Project area and bear tracks have been noted in the vicinity of the deposits by LIM staff and contractors, but there have been no encounters to date. Such encounters with black bears in the Schefferville are rare. Nuisance bears have not been reported by workers at the LIM site itself.

Moose (*Alces alces*)

Moose are a relatively new species to Labrador that were first reported in western Labrador in 1949 (Folinsbee 1974). The population expanded to an estimated 5,000 individuals in Labrador by 1990 (Karns 1997). Due to the relatively low numbers of moose in the Schefferville area, there are only five hunting licenses for all of western Labrador designated annually (Parr, T. and Porter, C. 27 November, 2008).

Moose tend to be associated with mid-successional forests, favouring areas of highest forest productivity preferring stands where trees reach heights of 3 m and therefore are available above snow (Newbury et al 2008; Bergerud and Manuel 1968). They also favour lakeshores and swamps (Banfield 1973). Likely due to habitat constraints, moose are not common in the Project area. As the Project area is situated on the edge of tundra and thinning forest communities, there are few hardwood species in this part of Labrador thus habitat requirements for this species are either not available or limited.

Furbearers

There are several furbearers in the vicinity of the Project. The species below, with the exception of wolverine and fisher, are trapped in western Labrador from fall to early spring (exact dates differ depending on species). There are no registered trap lines in Western Labrador and therefore trappers use their own discretion when choosing suitable sites and proximity to others (Porter, C. 27 November, 2008).

Beaver (Castor canadensis)

The beaver population in western Labrador is healthy and actively trapped with good returns (Porter, C. 27 November, 2008). There is a history of beaver in the Slimy Lake area as identified at a trapper's meeting held 13 August, 2008 in Schefferville. However, there are no individuals noted in this area at present which may be attributed to the absence of deciduous trees (particularly aspen) in this region, and thus a lack of food source. An old beaver lodge is present but is currently occupied by otter.

Beavers are herbivores, subsisting solely on woody and aquatic vegetation. They will eat fresh leaves, twigs, stems, and bark. Beavers will chew on any species of tree, but preferred species include alder, aspen, birch, maple, poplar and willow. Aquatic foods include cattails, water lilies, sedges and rushes.

Otter (Lutra canadensis)

This amphibious mammal has a healthy population in western Labrador. Typically otter are found no more than a few hundred meters from water and indeed they may be found in almost any water source with the presence of fish in western Labrador (Porter, C. 27 November, 2008) as they are entirely dependent on aquatic habitats for food. They are actively sought by trappers for their thick pelage. An otter has been observed occupying an old beaver lodge on Slimy Lake in the Project area, as noted at a trapper's meeting held 13 August, 2008 in Schefferville.

Mink (Mustela vison)

Mink are found throughout western Labrador in small brooks and ponds as they are proficient swimmers. Trappers in western Labrador are having great success with returns this year and it is believed the population is quite healthy (Porter, C. 27 November, 2008), although no presence of mink (i.e. tracks) has been noted at the Project area during summer or winter.

Muskrat (Ondatra zibethicus)

Muskrat numbers in western Labrador are currently at a high level and may be found throughout the region in a variety of aquatic habitats with cattail being an important food source (Feldhamer and Thompson 2003). Trappers in this region are currently experiencing good success (Porter, C. 27 November, 2008). Despite relatively high numbers of this species in the Labrador City area no evidence of muskrat has been found in the Project area. Lack of suitable vegetation for forage may be a factor.

Coyote (Canis latrans)

Coyote are not prevalent in western Labrador and they have not been observed in the Project area. It is rare to see or hear reports of this species in the western Labrador region (Porter, C. 27 November, 2008) although the presence of large ungulates and snowshoe hare may indicate suitable habitat for coyote.

Ermine (weasel) (Mustela erminea)

Weasel maintains a healthy population in western Labrador where they feed on primarily snowshoe hare, small mammals and birds. They can be found in a variety of habitats including wooded and brushy areas, wetlands and tundra. Ermine have not been reported in the Project area, although it is suspected they are in this area due to suitable habitat and prey availability. Hunting and predation are limiting factors for ermine populations although weasels are not actively sought by trappers, but are reported as incidental catches (Porter, C. 27 November, 2008). Predators may include snowy owls, arctic fox, lynx and large raptors.

Red Fox (Vulpes vulpes)

Red fox has been in decline the past two years in western Labrador. They are relatively common around areas of human presence such as mining and construction sites (Porter, C. 27 November, 2008), but specific to the Project area, there have been no observations of red fox; However, there has been one red fox noted near the Schefferville landfill. Habitat requirements include forests with safe denning sites. The omnivorous red fox preys on small mammals, birds and berries, while predators include wolves and coyotes (if present).

Arctic Fox (Alopex lagopus)

Arctic fox are found throughout the northern part of western Labrador. In this region their range extends south to approximately 100km north of Labrador City/Wabush (Porter, C. 27 November, 2008). Although habitat and prey requirements seem to be met within the Project area, no arctic fox have been observed in the Project Area (Parks, D. 3 December, 2008). Wolves, Golden Eagle and bears are common predators of this species.

Lynx (Lynx lynx)

The Lynx population is considered healthy, but not dense (Porter, C. 27 November, 2008). There are occasional sightings of lynx in western Labrador. Although some of the most commonly observed tracks in the Project area were of snowshoe hare of which lynx populations are closely linked, the absence of large tracts of forest in this region likely preclude lynx from inhabiting this area. Young lynx rely heavily on dense cover for protection and as a result, regenerating stands and/ or stands with thick understory are important to this species (Mowat and Slough 2003). No lynx have been observed in the Project area (Parks, D. 3 December, 2008).

Marten (Martes Americana)

The marten population of western Labrador is considered healthy however its presence in the Project area has not been noted. Marten are typically forest dwellers and require a variety of features provided in forest stands and landscapes, therefore habitat requirements may not be met due to lack of forest structure in this area.

Currently, marten are the most important furbearer in Labrador due to the high number of individuals and the high pelt price (Porter, C. 27 November, 2008). Trapping and habitat availability are limiting factors for marten.

Squirrel (Tamiasciurus hudsonicus)

Squirrel are plentiful throughout western Labrador however their presence in the Project area is not known. They are typically found in a wide variety of habitats but may be limited to south of the tree-line as they use coniferous trees for both food and shelter. Since the Project area is on the edge of forest communities it is thought red squirrel populations may be less dense here than further south. They are not sought by trappers but are incidentally trapped (Porter, C. 27 November, 2008).

Wolverine (Gulo gulo)

Wolverine, listed both federally and provincially as *endangered* are typically found wherever there is prey available and has not been linked to specific habitats, occurring throughout its' range in a wide variety of habitats. Although both migratory caribou and wolf are known in this area and are associated with wolverine diet, wolverine presence is currently not known in western Labrador (Porter, C. 27 November, 2008). No observations of wolverine or wolverine sign have been made in the Project area.

Wolf (Canis lupis)

Wolf are considered stable in the area with little fluctuation based on the availability of small mammal prey. The availability of primary prey, largely ungulates, is thought to be more important to wolf than specific habitat requirements. Wolf is common in western Labrador with individuals ranging tremendous distances in pursuit of prey such as caribou. Wolves have been observed along the southern ridge in an area of open barrens adjacent to the Project site.

Fisher (Martes pennanti)

Overhead cover, denning sites, and foraging habitat, all of which are often provided by deciduous forests, are necessary habitat requirements for this species. As well, coarse woody debris provides necessary structure which is a factor in defining foraging habitat as well as providing shelter in cold climates. As the Project area is situated on the edge of tundra and thinning forest communities, these requirements are likely not met here thus reducing the likelihood of fisher presence in this area. There has been no evidence of fisher observed in the Project area.

Porcupine (Erethizon dorsatum)

Although not a furbearer, porcupine has been included here due to their importance to local people. The porcupine can be found in a variety of habitats including coniferous, deciduous and mixed forests and can also be found in scrubby areas. Porcupine presence has been noted in one location southeast of Wishart Lake (trapper's meeting held 13 August, 2008 in Schefferville).

Small Mammals

Small mammal populations reached peak levels in western Labrador (from Labrador City to Churchill Falls) in 2007 (Porter, C. 27 November, 2008). The small mammals believed to be present in Western Labrador include: Bog lemming (*Synaptomys borealis*), Ungava lemming (*Dicrostonyx hudsonius*), Red-backed vole (*Clethrionomys gapperi*), Heather vole (*Phenacomys intermedus*), Meadow vole (*Microtus pennsylvanicus*), and Masked shrew (*Sorex cinereus*). Jumping mice (unknown species) were trapped in the Schefferville area in 2007 and 2008 at two sites: near water and an open area (Millien, V. 2 Dec 2008).

4.2.3 Avifauna

AECOM conducted a bird survey at the Project site in 2008.

4.2.3.1 Methods

To aid in the field investigations and recorded observations, the following reports and websites were reviewed to gain a better understanding of the Project area:

- 2008. New Millennium Capital Group, Paul F. Wilkinson and Associates Inc. – Project Registration, Direct Shipping Ore Project. 2008;
- Maritime Breeding Bird Atlas – 2001-2005;
- Wild Species Canada- webpage;
- Ministry of Natural Resources, 2000. Significant Wildlife Habitat: Technical Guide; and
- NatureServe Global Conservation Status Ranks – webpage;

Field Sampling

Field investigations followed the point-count method advocated by the Canadian Wildlife Service (CWS). For all of the point-counts, the highest level of breeding, as defined in the Maritime Breeding Bird Atlas, for each species was recorded. This enabled identification of site specific locations of breeding birds, within the point-count radius.

In order to complete this study, variable proximity locations were chosen. Point-counts were 5 minutes in duration and consisted of unlimited radius, except where adjacent count circles overlapped. All point-counts were conducted in conditions considered acceptable for proper data gathering (i.e., no rain, light winds, and good visibility). The spacing and frequency of point-counts within the study areas were determined by the following factors; size of the study site, topography and line of sight, habitat type and frequency of distinctive habitats and overall importance of a site to the objectives of the study. At Redmond and James point-counts were spaced at approximately 0.8 km intervals. The number of point-counts for both the large and small sites increased in areas of distinctive habitats.

4.2.3.2 Results

The following presents the findings from the field investigations completed from July 8-14, 2008. Species observed as possible breeders are listed for each site along with their provincial and global ranks. Bird Monitoring Locations are identified in Figure 4.17. A complete list of bird species noted can be found in Appendix M.

James Property

The James site was surveyed primarily from the edge of the service road. The uniform habitat composition consisted of black spruce (*Picea mariana*), lichen woodland, and also included alder (*Alnus* sp.) thickets along the recently cleared roadsides and power line right-of-ways. The area also contained wet areas near the roads. The western part of this site has steep slopes, with the forest thinning towards the summit.

A total of 31 bird species were observed at 13 separate point-counts, all displaying some indication of breeding. Six of the 31 species were confirmed breeders, with another six species considered as probable breeders. Appendix M provides a description of preferred habitat for each species along with the indication of breeding observed. Only species confirmed as breeding are included. A complete list of observed species is provided in Appendix M.

The eight most frequently recorded species within the James site, consisted of those associated with spruce forest. The wet and dense nature of vegetation at the James site resulted in a different avifauna community. Of these species, White-throated Sparrow is usually found in moist or bog-like situations and Northern Waterthrush is usually associated with alder thickets adjacent to a wetland.

Silver Yard Property

The Silver Yard is similar to the Redmond site, with numerous service roads encircling the flooded pits of the Ruth and James sites. The service roads, along the north and south orientation, were extensively bordered with alder and willow regeneration. The pit perimeter had minimal to no vegetation cover, while the open water component of the pits provided loafing areas for Herring Gull, however no obvious waterfowl nesting habitat was present.

The south end of this site had more extensive vegetation cover, with some areas consisting of dense spruce, and extensive thicket habitat along the roadsides. The Silver Yard as a whole, is part of a large valley bordered on the east by a talus slope forested at the base, and to the west by another slope covered with spruce at the base thinning to essentially no forest cover or vegetation near the summit.

A total of 26 species were observed at 7 separate point-counts, 25 of them displaying some indication of breeding. Appendix M provides a description of each species preferred habitat along with the level of breeding observed.

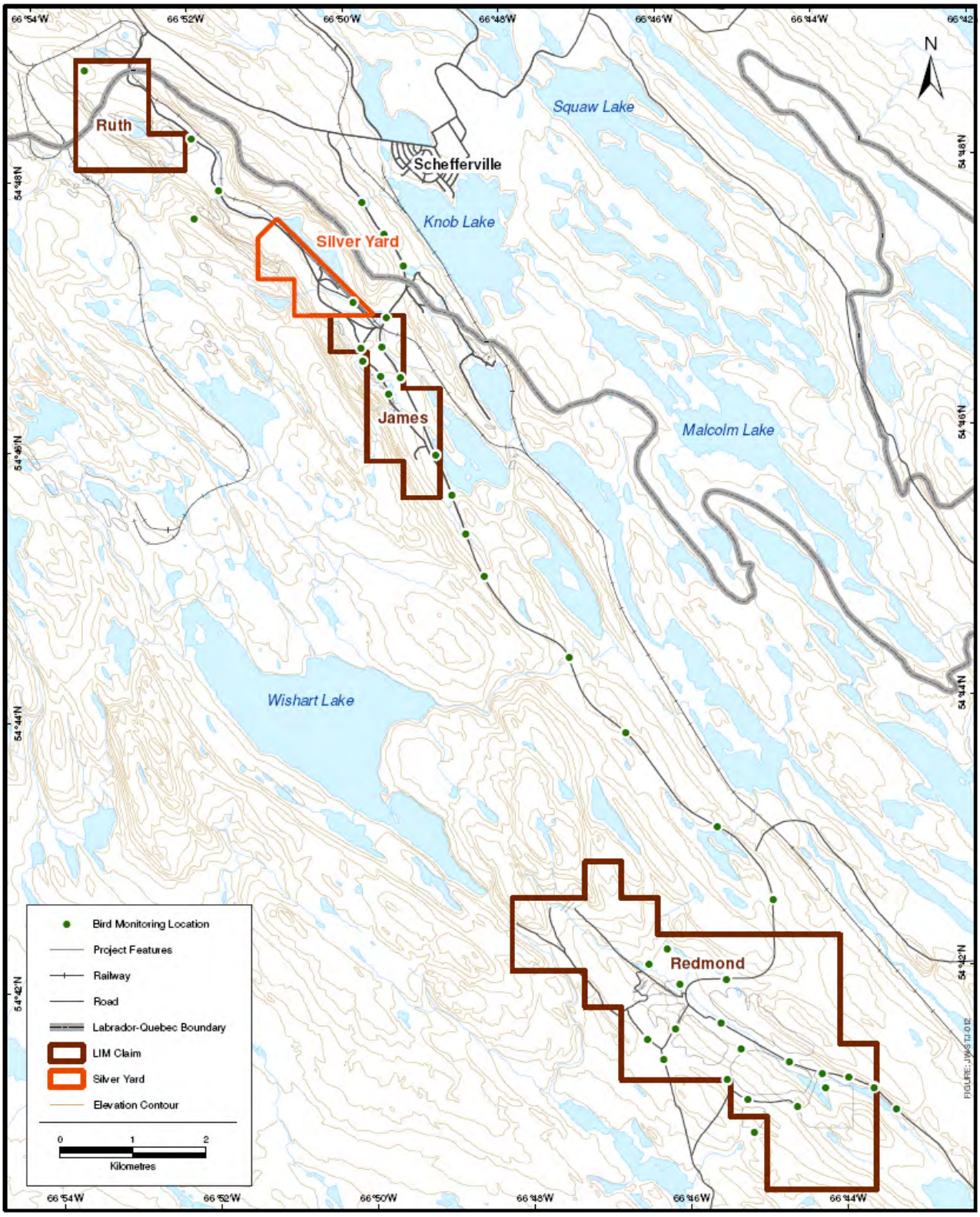


Figure 4.17 Bird Monitoring Locations

The most frequently recorded species at the Silver Yard site, were spruce forest specialists such as Fox Sparrow, Ruby-Crowned Kinglet, and Swainson's Thrush. Also observed in moderate numbers were species favouring regenerative / open habitats such as White-crowned Sparrow, and Common Redpoll. The widespread occurrence of Common Raven and Herring Gull was directly attributed to the proximity of the Schefferville landfill.

The spruce forest specialists observed east and west of the main service roads, with the forested slopes. Whereas the roadside areas attracted the regenerative specialists, due to the extensive areas of alder and willow present wherever the land had been cleared or disturbed.

Redmond Property

The Redmond site had a wide range of habitat types, largely due to the presence of a former mine and pit operation. The habitats ranged from completely bare ore piles and service roads, to heavily blanketed areas with alder and willow thickets. This area also had a large, flooded pit in the southwest corner of the site.

The undisturbed areas were occupied with mature black spruce at lower elevations, and stunted spruce – lichen along the ridge summits. This site also contained several wetland areas, most notably a large sedge fen enclosed by the former railway turning circle, as well as a lake / fen complex present where the main service road enters the Redmond site.

A total of 40 species were recorded on 24 separate point-counts, with 39 of the observed species displaying some indication of breeding. Appendix M provides a description of each species preferred habitat along with the level of breeding observed.

The disturbed nature of the Redmond site and variety of vegetative species appeared to have influenced avifaunal diversity compared to more homogeneous sites. It is likely that the regenerative nature of disturbed areas account for some of the increase in diversity.

White-crowned Sparrow, which is often associated with disturbed sites and more open habitats, was the most frequently recorded species. Of the other more frequently recorded species, most are spruce forest specialists, except the Lincoln's Sparrow found occupying the wetter components of the site.

National / Provincial Species at Risk

The following bird species of special conservation status were observed.

Rusty Blackbird – one bird was observed on one point, Redmond Site. This species is designated as a COSEWIC Special Concern species, listed 'vulnerable' (Schedule C) in Newfoundland and Labrador. Rusty Blackbird usually nests in coniferous forest along the edge of a wetland. There are numerous areas of habitat suitable for this species within the Project area. Displacement of this species is, therefore, not considered to be limiting as any birds of this species would easily relocate to adjacent alternative habitat. This species occurs throughout most forested areas of Labrador (Godfrey 1986; Nature Serve 2007). Rusty Blackbird has undergone a widespread and substantial decline across its range.

Gray-cheeked Thrush is associated with coniferous forest that has a dense understory (Lowther et al. 2001, Dalley et al. 2005). In Labrador this species usually breeds in mature black spruce, white spruce, white spruce, balsam fir, and tamarack (Lowther et al. 2001). Gray-cheeked Thrush was generally found in the Project area, in areas of small spruce, thinly distributed, with an abundance of shrubby

groundcovers, often heaths or alder thickets. The species was often found in higher elevations than other thrush species, avoiding the more densely wooded areas in the lowlands. They were most common along the margins of the open habitats, especially where the site transitions from open taiga to spruce, towards the north end. Outside of Labrador, the decline of these species relates more to alteration of habitat and risk of mortality during migration.

To address potential interaction with nest sites of these and other bird species, an Avifauna Environmental Management Plan (EMP) to address incidental take (the inadvertent disturbance of a nest site) will be completed consistent with the *Migratory Birds Convention Act*. This Avifauna EMP would be prepared and implemented prior to the start of construction.

4.2.3.3 Raptors

Ospreys (*Pandion haliaetus*) were noted throughout the Project area. There are no nest sites noted directly on the James, Silver Yard, or Redmond areas. However, one Osprey nest was noted on the existing transmission line corridor to Menihek less than 150 m from the active roadway connecting the James and Redmond Properties. This nest has been active for the past several years, with young being fledged successfully, as noted by LIM employees working in the area. Two adults were noted during the counts on the James Property. At Silver Yard, one adult was noted on one point-count. Standard mitigation measures regarding construction and operation related activities for active Osprey nests are to avoid such areas by at least 200 m.

A Bald Eagle (*Haliaetus leucocephalus*) has been noted within the Project area during field work. This species has been observed flying over Bean Lake and has only been noted in the vicinity of the James Property. No nest locations have been identified for this species in the general vicinity of the Project area. One 3rd-year immature was also observed along Bean Lake. This species is locally uncommon but increasing (Brown, pers. comm., June 2005).

4.2.4 Fish and Fish Habitat

AECOM conducted fish surveys at the Project site in 2007 and 2008.

4.2.4.1 Methods

Surveys were conducted to characterize fish habitat and fish species present in the study area (i.e., the lakes and streams in the Project area as shown in Figure 4.18). Habitat is described using the methods and terms outlined by Sooley et al. (1998) and McCarthy et al (2007 Draft) and fish sampling was conducted using methods detailed in Sooley et al (1998).

Qualitative measures undertaken include rod and reel angling and visual observations for fish in lakes, visual determinations for fish species in streams, along with general fish habitat characterization for areas adjacent to the proposed works.

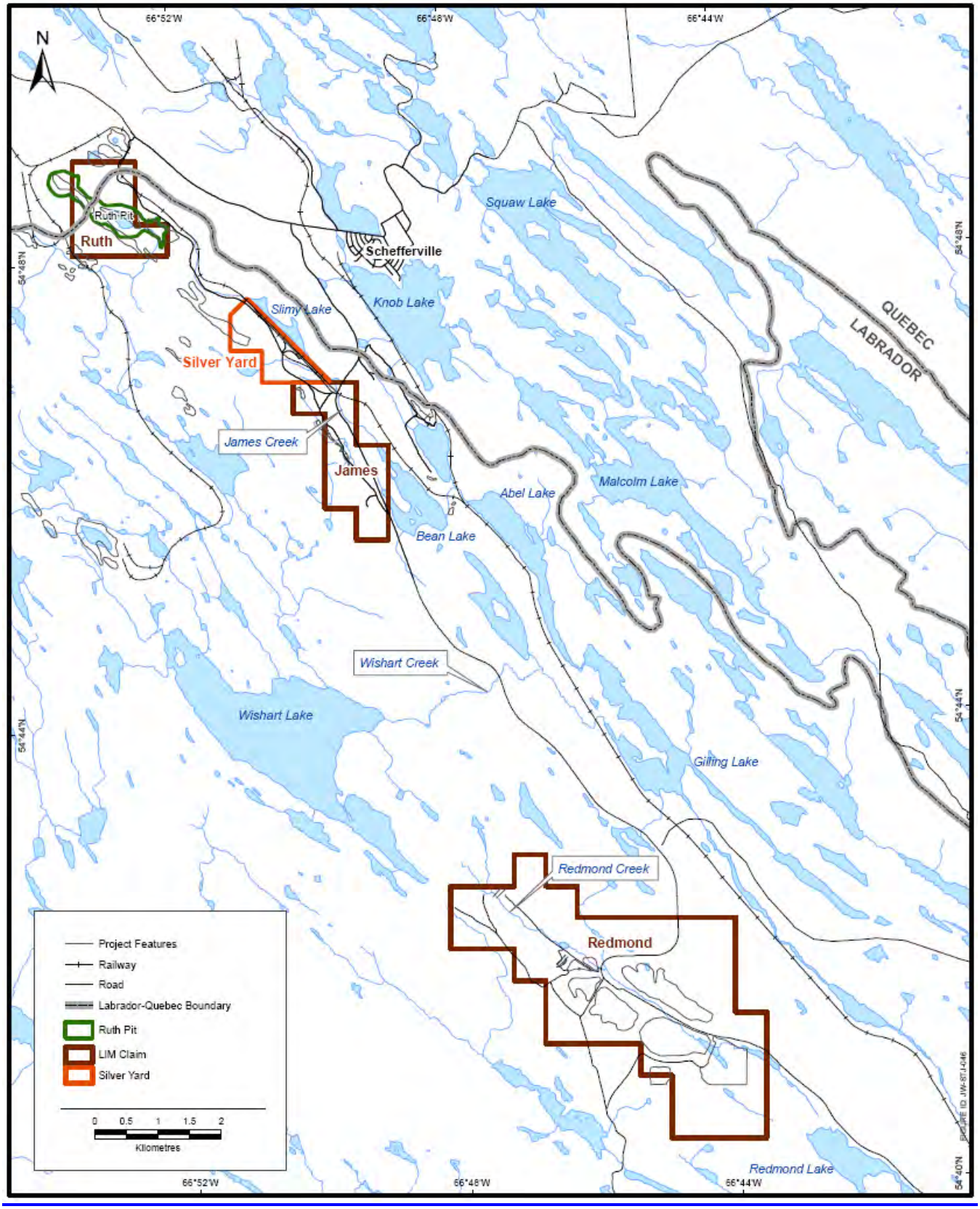


Figure 4.18 Lakes and Streams in the Project Area

4.2.4.2 Assessment Area Boundaries

Spatial and Temporal

The Project boundary includes surface water bodies in the subwatersheds that contain the Project. Temporal Project boundaries are seasonal for construction and operation, as there will be a winter shutdown of mining activities.

The ecological boundaries for the freshwater fish and fish habitat will align closely to the watershed boundaries. The Project lies within a set of subwatersheds that flow to a chain of narrow lakes stretching from the Project area southeast to Astray Lake in the upper Churchill complex of lakes and reservoirs.

Furthest north, the area of the Ruth Pit drains to James Creek, which in turn flows to Slimy Lake and then Bean Lake, east of the James Deposits (Figure 4.18). There is also a small unnamed tributary that originates on the James Property that flows into Bean Lake. The flow from Bean Lake continues through Abel Lake, Gilling Lake, to Astray Lake, which are all to the south of the James deposit.

Drainage on the Redmond Property is via Redmond Creek, which flows southeast into Redmond Lake and then on to Astray Lake. Generally the spatial boundary of the fish and fish habitat study area will be limited to the active mine sites, with limited or no downstream effects.

Administrative and Technical

The regulatory boundaries of the Project fall under provincial and federal jurisdictions. As in other areas of Newfoundland and Labrador, freshwater aquatic resources are regulated by several provincial and federal departments. *The Fisheries Act* is the primary federal legislation governing protection and management of fish and fish habitat in freshwater environments. The Department of Fisheries and Oceans (DFO) holds jurisdiction for fisheries and fish habitat protection in the Province. Similarly, the DFO recreational and commercial regulations are in effect for the Project site. Environment Canada has responsibility for Section 36 of the *Fisheries Act*, which regulates the release of deleterious substances whereas DFO is responsible for sedimentation issues.

For the watersheds of the Project site, the Water Resources Division of Environment and Conservation oversee water quality and water quantity pursuant to the *Waters Resources Act* (2002). This Act regulates development within 15 m of a waterbody and provides regulations regarding development within wetlands and flood plains. This guidance under the *Water Resources Act* includes the *Environment Control (Water and Sewage) Regulations* that regulate discharges to a body of water.

Fish habitat on the Project site was assessed using the DFO fish habitat assessment guidelines for assessing lacustrine and riverine habitats. Detailed habitat mapping of the unnamed tributary on the James Property was completed to quantify fish habitat. In other areas of fish and fish habitat not expected to be directly impacted by the proposed mining operations, fish were assessed by qualitative measures that included rod and reel angling and trap netting.

Assessment Area

The Assessment Area for determining Fish and Fish Habitat are those waterbodies that may interact with the Project (Ruth Pit, James Creek, Slimy Lake, Bean Lake, Unnamed Tributary, Redmond Creek, Redmond Lake).

4.2.4.3 Results

Ruth Pit

Gillnetting surveys verified that the Ruth Pit has no sustained fish community, so fish habitat has not been characterized for the flooded pit. These survey results were submitted to DFO, which subsequently confirmed that it does not consider the existing flooded open pits to be fish habitat. (Yetman 2008, *email communication*)

James Creek

James Creek is a small stream that originates from the Ruth Pit, as a result of water seepage from the flooded pit (Figure 4.7). Drainage occurs via a perched culvert, which is collapsed at the inlet end and fish are therefore prevented from entering the flooded pit. The stream section between Ruth Pit and Slimy Lake has an average wetted width of approximately 2.0 m and depths ranging between 0.2 m (riffles) and 0.8 m (pools). The stream section between Slimy Lake and Bean Lake increases to a wetted width of approximately 3.0 m with depths similar to the upstream section. Substrates of the stream consist largely of gravel and cobble, with minimal sediment deposition within main channel. All stream banks were observed as stable, with no erosion evident. Stream gradient was estimated at 2%.

Field surveys confirmed that James Creek contains brook trout (*Salvelinus fontinalis*) and sculpin sp. (*Cottus* spp.). Fish species within Slimy and Bean Lakes include longnose sucker (*Catostomus catostomus*), brook trout, lake whitefish (*Coregonus clupeaformis*), pearl dace (*Margariscus margarita*), white sucker (*Catostomus commersoni*), lake trout (*Salvelinus namaycush*), burbot (*Lota lota*), sculpin, and spottail shiner (*Notropis hudsonius*). These species have access to James Creek, but only the presence of brook trout and sculpin were confirmed in the sampling program.

Slimy Lake

Slimy Lake has a surface area of approximately 13.8 ha, with a maximum depth of 8 m. Riparian vegetation consisted of alder thicket to the south and west and sparse black spruce forest to the north and east. Sediments are predominantly fine particulates.

A quantitative fyke netting program (48 hours total) was conducted on Slimy Lake during 2008. This netting effort indicated that the fish community was dominated by longnose sucker (n = 99). Other species captured include: brook trout (20), lake whitefish (4), pearl dace (2), white sucker (1), and lake trout (1). Angling efforts resulted in the capture of six lake trout (1.5 – 2.5 kg) in 2 hours.

Bean Lake

Bean Lake has a surface area of approximately 54.7 ha, with an estimated maximum depth of 15 m. The riparian vegetation consists of black spruce forest along most of the shoreline, with the exception of alder thickets along the north eastern shore along the railway spur bed and also along the James to Redmond Road, immediately adjacent to Bean Lake on the south western shore. The littoral sediment was dominated by gravel and sand along most of the lake, with the exception of fine sediments being identified at the inlets of James Creek and at the small bay immediately adjacent to the Redmond and James Road. Within the sediments identified near the James Creek inlet, aquatic macrophytes (*Potamogeton spp*.) were evident.

A fyke netting program (72 hours total) completed on Bean Lake during 2008 identified that the fish community is dominated by longnose sucker (n =302). Other species captured include: lake whitefish

(90), white sucker (87) pearl dace (39), brook trout (31),) burbot (17), sculpin (3) and spottail shiner (1), and lake trout (1). Angling efforts captured six lake trout (1.5 – 2.5 kg) in 2 hours.

Unnamed Tributary - James Property

Within the James Property, a small first order tributary originates from two artesian sources (James North Spring and James South Spring) (Figure 4.11). James North Spring is located between James North and James South pits. This tributary is approximately 1000 m in length and flows in a south easterly direction and discharges into Bean Lake. Another small spring (James South Spring) originates from the southern end of the James South ore body and flows north easterly to the unnamed tributary, approximately half way between the tributary's origin and Bean Lake

Details of habitat characterization of the unnamed tributary are in a report that is included in Appendix N. The unnamed tributary consisted predominantly of flats and runs. Riffles and glides are also present but true pools were limited in number. The substrate in the riffles and runs is typically cobbles and gravels and in the flats, sand, silt and detritus dominated. In many flat sections however, gravels occurred under the fines and during the fall 2007 survey, redds that had been excavated down to the gravel were observed in some of these flat sections. Cover for fish in flat sections was dominated by undercut banks and overhanging grasses. In the runs, the dominant cover was typically overhanging alders and willows.

The smaller tributary that flows into the unnamed creek has a mean wetted width of 1.0 m, which has margins choked with watercress, reducing the functional width to 0.5 m.

The approximate areas of available spawning, rearing, migration and adult resident habitat types are 351 m^2, 1227 m^2, 0 m^2 and 5716 m^2, respectively (See Table 1 in Appendix N).

There appeared to be a pronounced decrease in the volumes of water flowing from the springs during the winter months. Sampling for the James North Spring indicated that flows were markedly reduced, as it took over one minute to fill a 1 L bottle. Attempts to winter sample pool locations along the tributary found the pools were frozen solid to the substrate.

Visual surveys of the unnamed tributary identified brook trout and sculpin. The discharge of this creek into Bean Lake contains a perched culvert with 0.5 m drop, preventing access, by most species in Bean Lake, to this tributary. However, during the spring 2008 sampling program, it was noted the brook trout were swimming upstream from Bean Lake into the tributary; fish were observed jumping into the culvert and successfully moving upstream from the road crossing.

Wishart Creek

Wishart Creek flows east from Wishart Lake for approximately 4.5 km to Gilling Lake. The stream has an average wetted width of 5 to 6 m and depths ranging between 0.2 m (riffles) and 1.5 m (pools) within the vicinity of the existing road crossing. Substrates of the creek consist largely of gravel and cobble, with minimal sediment deposition within main channel. The stream banks were observed as stable, with no erosion evident. Stream gradient ranged between 1.5 to 3%.

Visual surveys of Wishart Creek identified the presence of brook trout and sculpin. Other resident fish species within the Wishart watershed also have access to the creek, but only these two species were confirmed as present.

Redmond Creek

Redmond Creek is a small stream that originates within the Redmond Property, as a result of surface and groundwater flows (Figure 4.12). For example, one source is a large spring located immediately adjacent to the Redmond 1 Pit. The creek also receives a diffuse flow from the area of the road and historic mine works. Observations indicated the channel has an average wetted width of approximately 1.5 m and depths ranging between 0.15 m (riffles) and 0.4 m (pools). The substrates of the creek consist largely of gravel and cobble, with minimal sediment deposition within main channel. During electrofishing, disturbance of sediments resulted in the resuspension of reddish sediments. Riparian vegetation included a small section lined with alder, but the majority of the creek is adjacent to historic mining waste rock piles within the property boundaries. Stream banks were stable at low flows, but active erosion was noted along some channel sections, as represented by the presence of bare soils.

Electrofishing and qualitative visual surveys of Redmond Creek confirmed the presence of brook trout, in the lower section of the creek situated on the Redmond Property. During the spring freshet, longnose sucker and white sucker were reported by a local contact to enter the creek to complete spawning. Other resident fish species within Redmond Lake (~ 2 km downstream from the property) also have access to the creek.

4.2.4.4 Current and Future Fisheries

This region of Labrador and adjacent region in Quebec are known for abundant fish resources and the fisheries include recreational fisheries, commercial outfitter operations and a subsistence fishery by aboriginal peoples.

People fish anywhere they can obtain access to good locations. Access is provided by existing roads to old mine areas, exploration areas, and the Menihek hydroelectric facility. Adjacent to the Project site, locals angle brook trout in James Creek near the Silver Yard. Locations on James Creek are accessible by road. Less fishing is conducted on Slimy Lake as there is the perception, and evidence, that this lake was impacted by the past mining activities. All of the other Project areas are more distant from favoured angling streams and lakes.

There are several outfitter operations in the area. The closest outfitting camps are on Astray Lake to the south and Wishart Lake to the west. Most other camps are located in Quebec, which are different watersheds. Access to many of the camps is restricted to floatplane and helicopter as the road network is limited.

The subsistence fishery is pursued on both sides of the border with seasonal gillnet fisheries. These focus on the larger lakes as they usually produce larger fish (i.e., lake trout).

4.3 Socio-economic

This section provides information on the existing socio-economic conditions, including demography, community infrastructure and services, and employment and business. The geographic extent of the discussion varies by subject. Most aspects of the socio-economic environment will be examined for the Assessment Area, which includes both western and central Labrador, defined geographically as the Hyron (Labrador West) and Central Labrador (Upper Lake Melville) Economic Zones (Figure 4.19). While all Project activity will occur in Labrador West, the baseline conditions in central Labrador also need to be included because Project labour, goods and services are also going to be drawn from there.

Baseline information is presented at the provincial, Labrador, and Assessment Area levels as appropriate, with further detail for communities within the Assessment Area provided where necessary. Selected data are also presented for Schefferville and other Quebec communities adjacent to the Project site.

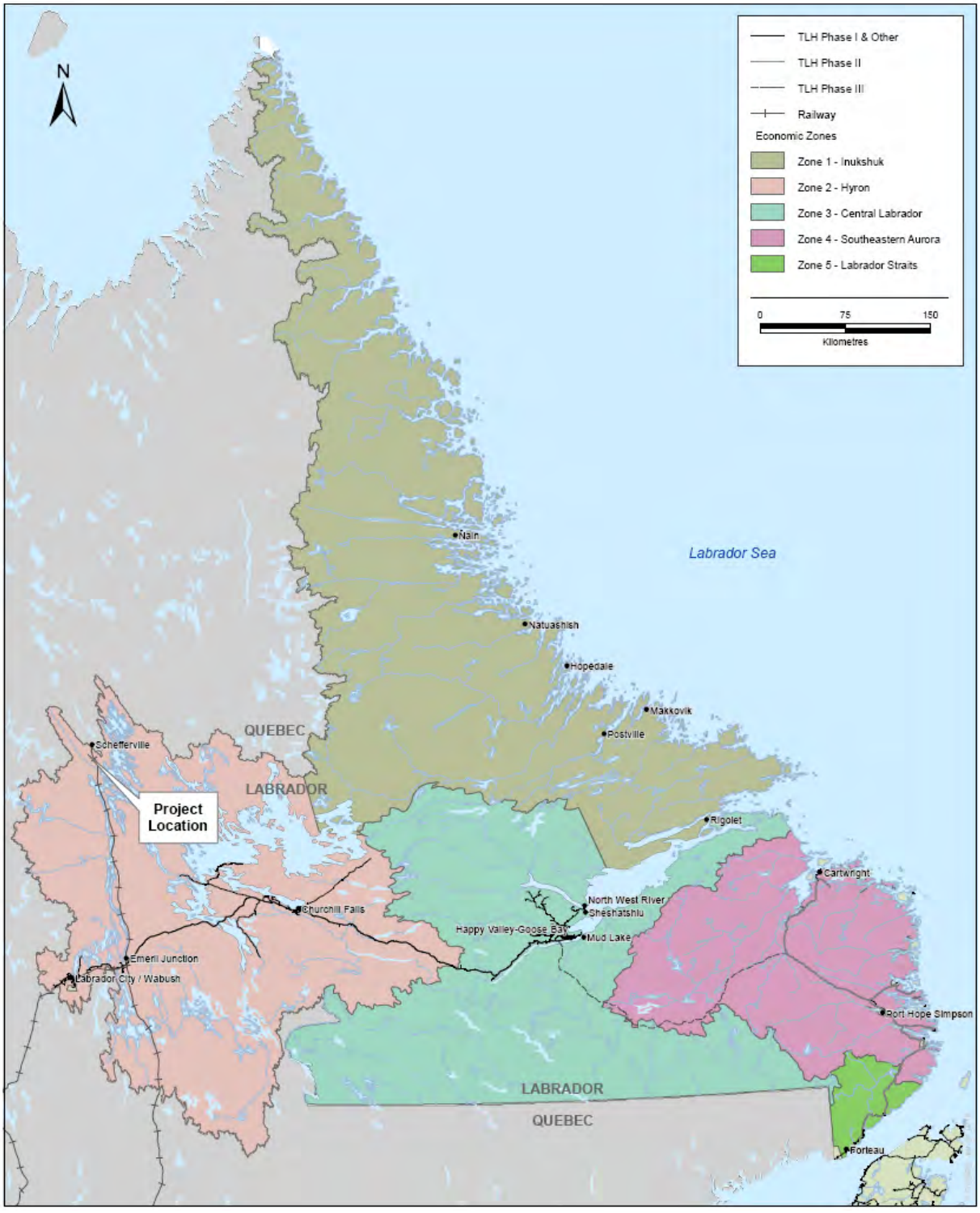


Figure 4.19 Study Area and Economic Zones of Labrador

4.3.1 Methodology

The baseline data presented in this section were drawn from a wide range of secondary sources including:

- Statistics Canada and other agencies and departments of the Government of Canada;
- Newfoundland and Labrador Statistics Agency and other agencies and departments of the Government of Newfoundland and Labrador; and
- Municipal governments and local and regional authorities and boards.

Not all information is available for the same geographic areas. For instance, census data are available for some communities in the Upper Lake Melville Area (for example, Happy Valley-Goose Bay and North West River, which are located in Census Division 10, Subdivision C), but data for Sheshatshiu and Mud Lake are aggregated and classified as Census Division 10, Subdivision C, SUN. Other data are only available by Economic Zone and not for individual communities. The communities in Labrador West fall under Economic Zone 2 – Hyron Regional Economic Development Corporation and the communities of the Upper Lake Melville Area comprise Economic Zone 3 – Central Labrador Economic Development Board.

In addition to data from the above secondary sources, primary information was collected through personal and telephone interviews with key informants with groups and agencies at the community, regional and provincial levels.

4.3.2 Demography

An understanding of the demographic structure and its potential for change without the Project provides a basis for determining Project-related changes. The following discussion focuses on the demography of western and central Labrador and, where relevant, that of Labrador and the Province. There is also an overview of the Quebec communities in close proximity to the Project site.

4.3.2.1 Population

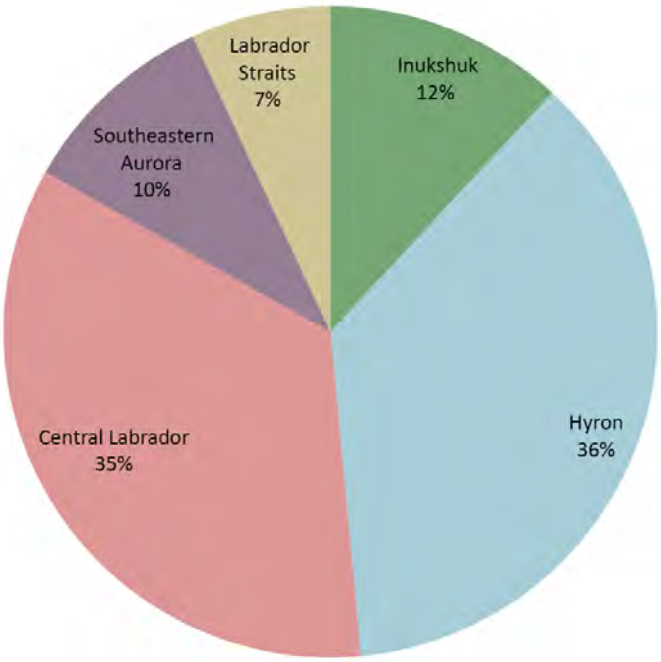
Labrador

The 2006 Census reports that there are 26,364 people residing in 32 communities across Labrador, of which 50.7 percent are male and 49.3 percent are female. In 2006, Labrador's population made up 5.2 percent of the provincial total (Statistics Canada 2006). In Labrador and the Province in 2006, the majority of the population was between the ages of 35 and 64 (44.4 and 46.2 percent, respectively) Those aged 15 to 34 represented the smallest portion of the Province's population (6.1 percent) while the 65 plus age group represented the smallest portion of Labrador's population (6.3 percent) (Statistics Canada 2006). Thirty-five percent of the people living in Labrador have Aboriginal ancestry, self-identifying as Innu, Inuit or Métis (Newfoundland and Labrador Department of Labrador and Aboriginal Affairs [NLDLAA] 2006).

Between 1991 and 2006 Labrador's population fell by 13.1 percent, from 30,375 to 26,364. This was slightly greater than the overall provincial decline of 11.1 percent (Statistics Canada 2006).

For the purposes of economic analysis and planning, Newfoundland and Labrador is divided into 20 economic zones, five of which are in Labrador (Figure 4.19). In 2006, the economic zones in Labrador with the largest populations were those that are the focus of concern in this assessment: Hyron,

comprised of Labrador City and Wabush, and Central Labrador, which comprises Upper Lake Melville with populations of 9,660 and 9,175, respectively (Figure 4.20). The zone with the smallest population was Zone 5 (‘Labrador Straits’) with 1,825 people (Newfoundland and Labrador Statistics Agency 2008).

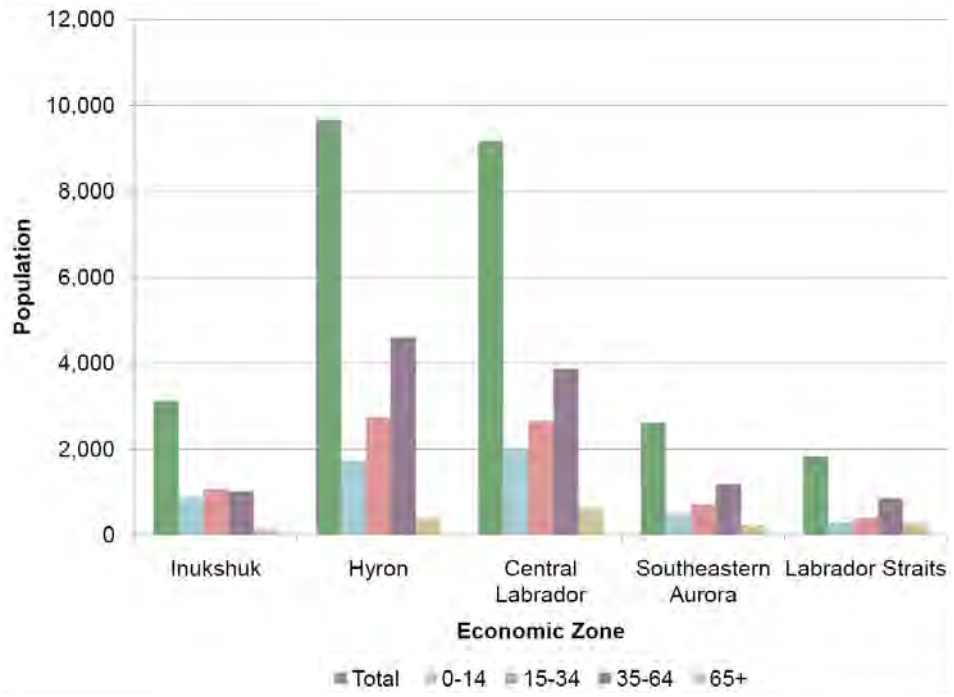


Source: Newfoundland and Labrador Statistics Agency 2006

Figure 4.20 Population by Economic Zone, as a Percentage of Labrador’s Population, 2006

The populations of all but one of the economic zones in Labrador decreased between 1991 and 2006 (Newfoundland and Labrador Statistics Agency 2008). The greatest declines occurred in Hyron (Labrador West and Churchill Falls) and Labrador Straits. The population Hyron fell by 20.8 percent, from 12,200 to 9,660 and Labrador Straits decreased from 2,185 to 1,825 (16.5 percent). Inukshuk (the North Coast of Labrador), however, increased by 4.5 percent from 2,985 to 3,120, but it too has declined between 2001 and 2006.

The age-structure of the populations of the economic zones is illustrated in Figure 4.21. Inukshuk is unique insofar as the proportion of younger people in the 0 to 14 and 15 to 34 categories is much higher than for the other zones (Newfoundland and Labrador Statistics Agency 2008).



Source: Newfoundland and Labrador Statistics Agency 2006

Figure 4.21 Population of Labrador Economic Zones by Age Group, 2006

Labrador West

In 2006, the population of Labrador West was 8,979, with the majority of living in Labrador City (Table 4.16). The area represents 34.1 percent of Labrador's population with slightly more men (51.6 percent) than women (48.4 percent) (Statistics Canada 2006).

Table 4.16 Population of Labrador West, Upper Lake Melville, Labrador and Province, 2006

Location	Total Population	Male	Female
Labrador City	7,240	3,740	3,505
Wabush	1,739	895	845
Labrador West Total	**8,979**	**4,635**	**4,350**
Happy Valley-Goose Bay	7,572	3,740	3,835
North West River	492	240	250
Sheshatshiu and Mud Lake (Census Division 10, Subdivision C)	1,112	560	555
Upper Lake Melville Total	**9,176**	**4,540**	**4,640**
Labrador	**26,364**	**13,380**	**12,985**
Province	**505,469**	**245,735**	**259,735**
Source: Statistics Canada 2006			

Compared to other parts of Labrador, a relatively small proportion of the population of Labrador West is identified as Aboriginal. In 1996, Aboriginal people represented only 1.5 percent of the population. However, by 2006, this had increased to 6.6 percent (Statistics Canada 1991; 1996; 2001; 2006). Visible minorities (persons who are identified according to the *Employment Equity Act* as being non-Caucasian in race or non-white in colour, with the exception of Aboriginal people) made up only 1.2 percent of Labrador West population.

As was discussed above, Labrador has a recent history of population decline. Between 2001 between 1991 and 2001, the population fell from 11,392 to 9,638 (15.4 percent). By 2006, the area's population had further decreased by 6.8 percent.

Upper Lake Melville

With a population of 9,176, Upper Lake Melville has 34.8 percent of the total population of Labrador (Table 4.16) (Statistics Canada 2006). In 2006, there were slightly more women (50.6 percent) than men (49.4 percent) living in the area and 82.5 percent of residents lived in Happy Valley-Goose Bay, the area's largest community.

As in Labrador West, the population of Upper Lake Melville has been in decline. It fell from 10,050 in 1991 to 9,654 in 2001, a decline of 3.9 percent. By 2006, the population had decreased a further 5.0 percent to 9,176, with Happy Valley-Goose Bay and North West River experiencing declines of 12.0 percent and 6.8 percent respectively. However, Census Division 10, Subdivision C (Sheshatshiu and Mud Lake) experienced a population increase of 21.9 percent. It should be noted that Statistics Canada data combine information for Sheshatshiu (approximately 1,050 people) with that for the much smaller community of Mud Lake (approximately 60 people), and few disaggregated data are available.

Sheshatshiu is an Innu community, and many Innu, Inuit and Métis live in Happy Valley-Goose Bay, North West River and Mud Lake. The Aboriginal population of the Upper Lake Melville Area increased from 2,035 to 4,130 between 1991 and 2001 and then decreased to 4,095 in 2006. Most (66.4 percent) Aboriginal people in that area reside in Happy Valley-Goose Bay. Of the 1,112 people in Sheshatshiu and Mud Lake in 2006, 1,035 (93 percent) were Aboriginal. In North West River, 340 (68.7 percent) of the population were Aboriginal, as were 2,720 (35.9 percent) of those in Happy Valley-Goose Bay.

Visible minorities comprised only 0.4 percent of the 2006 population in Upper Lake Melville, all of them living in Happy Valley-Goose Bay (Statistics Canada 2006).

Quebec Communities

The communities of Schefferville, Kawawachikamach and Matimekush are located in Quebec in close proximity to the Quebec-Labrador border and the Project. All three can be reached by air, through the Schefferville Airport, or by train from Sept-Iles. The Project will make use of accommodation camps, some municipal facilities and the airport, and will employ some workers and services located in these communities.

Schefferville is located approximately 2 km from Labrador on the north shore of Knob Lake. It was established by the Iron Ore Company of Canada in 1954 to support mining operations in the area. Schefferville had a 2006 population of 222 (France Pinot, pers. comm. 2006). Schefferville has no mayor, but is run instead by an Administrator. The Municipality and Matimekush Reserve are adjacent and closely linked.

Schefferville's services include:

- Fire: Fire Department - fire station, firefighting equipment
- Police: Police, Royal Canadian Mounted Police
- Medical Care: Dispensaire de Schefferville
- Waste disposal: Landfill site, garbage collection provided by band council, at municipal dump in Schefferville.

- Community: Community radio station, recreation centre, parish hall, gymnasium, playground, childcare centre, drop-in centre
- Water supply: Household supply, two community wells, pumping station
- Sewers: Community septic tank, lagoon
- Electricity: Schefferville Power Company

The Matimekush Montagnais and Kawawachikamach Naskapi are separated into two communities.

The Naskapi Nation of Kawawachikamach is comprised of the Village of Kawawachikamach, approximately 16 kilometres northeast of Schefferville, and a larger uninhabited area to the northeast of the Village. Kawawachikamach is now the largest community in the area, with 757 residents, including 186 off-reserve. The unemployment rate in 2004 was approximately 80 percent although that number has recently dropped to 60 to 70 percent. The main employers are Kawawachikamach Public Works, the post office and the school. Kawawachikamach's services include:

- School: Jimmy Sandy Memorial School (preschool, elementary, secondary I to V)
- Fire: Kawawachikamach Volunteer Fire Department - fire station, firefighting equipment.
- Police: Naskapi Police Force.
- Medical Care: Naskapi Local Community Service Centre provides medical and social services to community members.
- Waste disposal: Landfill site, garbage collection provided by band council, at municipal dump in Schefferville.
- Community: Community radio station, recreation centre, parish hall, gymnasium, playground, childcare centre, drop-in centre.
- Water supply: Household supply, two community wells, pumping station.
- Sewers: Community septic tank, lagoon.
- Electricity: Schefferville Power Company.

Matimekush Innu community has approximately 815 residents, including 100 off-reserve. The community is divided into two territories: the reserve of Matimekush, on the edge of Pearce Lake adjacent to the Schefferville Municipality; and the reserve of Lac-John, which is 3.5 km from Matimekosh and the centre of Schefferville.

When the Schefferville area mines closed in 1982, Matimekush needed many of the services provided by Schefferville (e.g. sewer and water system, school, arena), and it was decided to extend the reserve into a deserted part of the town. Matimekush's services include:

- School: Ecole de Kanatamat Tshitipetitamunu (preschool, elementary, secondary I to V)
- Fire: Provided by the Municipality of Schefferville
- Police: Matimekush Police Service
- Medical Care: Poste de Soins Infirmiers de Matimekush - Lac John (nursing station)
- Waste disposal: Landfill site, garbage collection by the Municipality of Schefferville
- Community facilities: Radio station, community centre, church, arena, gymnasium, library
- Water supply: Household supply, partial water treatment

- Sewers: Waste water sewer and storm sewer systems
- Electricity: Schefferville Power Company

4.3.3 Employment and Business

4.3.3.1 Introduction

Mining has provided a valuable foundation and cornerstone for economic development and growth in Labrador West, with a primary focus on iron ore. Large scale mining development projects are generally long term and capital intensive and often result in major economic and employment benefits similar to operations already existing in Labrador West (NLDLAA 2008).

Production mining is the main activity in Labrador West. The Iron Ore Company of Canada (IOC) operates its Carol Lake Mine out of Labrador City and Wabush Mines operates its Scully Mines from Wabush. The situation has not changed substantially since 1993 in terms of both mines being dependent on the fluctuations in the international market for steel and subsequently iron ore.

The Iron Ore Company of Canada began production from the Carol Lake Mine in 1962. IOC is Canada's largest iron ore pellet producer and operates a mine, concentrator, and pellet plant at Carol Lake, port facilities in Sept-Iles, Québec and a 420-km rail line that links the mine and the port. Total resources at Carol Lake are estimated to be 5.5 billion tonnes. Proven and probable reserves are 1.4 billion tonnes; indicated and referred reserves are 4.1 billion tonnes. Annual mine production at the open pit operation is in the 35 to 38 million tonne range at an average grade of approximately 40 percent total iron. Annual production capacity is 18 million tonnes of concentrate of which 12.5 million tonnes can be pelletized. In 2005 and 2006, IOC shipped a total of 15 million tonnes of iron ore, up 30 percent from 2004 (AMEC Earth and Environmental Ltd and Gardner Pinfold 2008).

The IOC announced a $500 million expansion in March 2008, and a further $300 million expansion in September 2008. However these plans, which would have increased production to 25 million tons per year by 2011, were postponed in December 2008.

Wabush Mines began mining iron ore from the Scully Mine in Labrador in 1965 and now operates a mine and concentrating plant at Wabush and a pellet plant and shipping facilities in Point Noire, Québec. All ore is mined by open pit and sent through the Scully Mine concentrator. The final concentrate is transported 443 km by rail to the port at Pointe Noire for pelletizing and shipment. The majority of ore is loaded onto ships bound for the Canadian and US Great Lakes region while the remainder is loaded for the US East Coast, Europe and more recently China. In 2005, Wabush Mines shipped 5 million tonnes of concentrate, up almost 29 percent from 2004. In 2006 it shipped 4.2 million tonnes, a drop of 17.9 percent from the previous year. In 2006 it spent more than $18 million on capital projects (AMEC Earth and Environmental Ltd and Gardner Pinfold 2008). However, in December 2008, Wabush Mines cut its production target for 2009 in half, and announced it was eliminating 160 jobs in February 2009.

Shabogamo Mining and Exploration Limited began producing silica in December 1999 and employs an average seasonal workforce of 18 people. Shabogamo has a contract to supply quartzite to Bécancour Silicum Inc. of Québec which uses the material to manufacture silicon metal. The company is actively involved in exploration throughout the Labrador West and total shipments in 2005 were estimated at 54,000 tonnes. Other materials of interest in Labrador West are aggregate, nickel, gold and graphite (AMEC Earth and Environmental Ltd and Gardner Pinfold 2008).

4.3.3.2 Employment

In general, the employment situation in Labrador, prior to the current economic downturn, was better than in the rest of the Province, and the situation in Labrador West is better than Upper Lake Melville. Participation rates were higher, unemployment rates were lower, and the average annual income was higher in Labrador West in 2006 (Table 4.17).

Table 4.17 Labour Force Characteristics, 2006

	Labrador City	Wabush	Total Labrador West	Upper Lake Melville	Labrador	Province
Total Population, 15 years and older	5,935	1,460	7,395	7,045	20,815	422,385
Labour Force	4,325	1,045	5,370	5,105	14,340	248,685
Participation Rate (%)	72.9	71.6	72.3	64.3	63.2	58.9
Unemployment Rate (%)	8.9	8.1	8.5	20.4	24.5	18.6
Median Income, 2005	$30,884	$36,091	$33,488	$24,196	$21,845	$19,573
Source: Statistics Canada 2006						

In 2006, the labour force (i.e., individuals who have, or are seeking employment) of Labrador West consisted of 5,370 individuals (Table 4.17), an increase from 4,395 in 2001. The participation rate, which is the percentage of the work-age population that is working or actively looking for employment, is much higher in Labrador West (72.3 percent in 2006, up from 67.5 percent in 2001) than in the Province (58.9 percent) or Upper Lake Melville (64.3 percent). Between 2001 and 2006, the unemployment rate in Labrador West fell from 9.1 to 8.5 percent.

Wages in Labrador West are higher on average than in the rest of the Province. In 2005, the median income from employment for residents of Labrador West averaged $33,488, substantially higher than the provincial figure of $19,573, and the Upper Lake Melville average of $24,196 (Table 4.17) (Statistics Canada 2001; 2006).

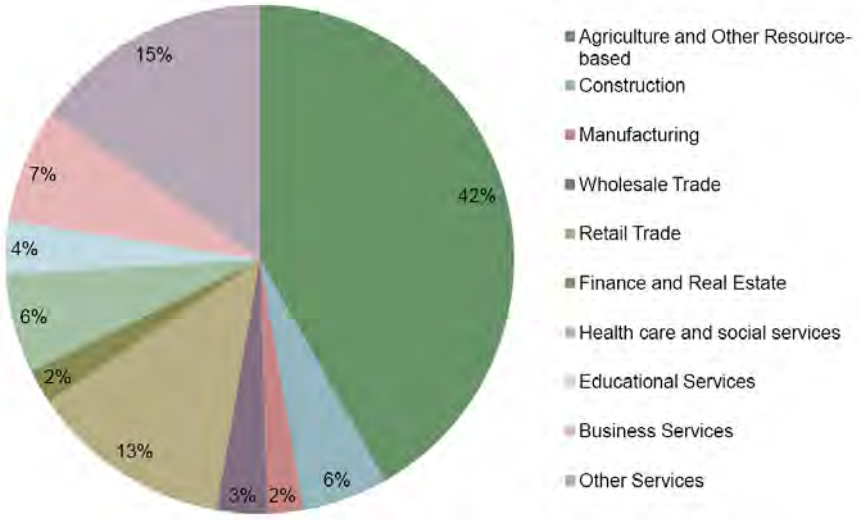
The number of individuals in Labrador West receiving employment insurance (EI) benefits decreased by 6.3 percent between 1996 and 2006. During the same period, the number of EI beneficiaries in the Upper Lake Melville decreased by 10.9 percent and the provincial beneficiaries decreased by only 4.7 percent (Table 4.18).

Table 4.18 Beneficiaries of Employment Insurance, Labrador City and Wabush, 2002 to 2006

	1996			2006			*% Change*		
	Labrador West	Upper Lake Melville	Province	Labrador West	Upper Lake Melville	Province	Labrador West	Upper Lake Melville	Province
EI Beneficiaries (Individuals)	1,370	1,605	102,825	1,155	1,430	98,025	*-15.7%*	*-10.9%*	*-4.7%*
EI Incidence (% of labour force)	21.4%	28.8%	39.9%	18.0%	25.5%	35.5%	*-15.9%*	*-11.5%*	*-11.0%*
Source: Newfoundland and Labrador Statistics Agency 2008									

The occupational structure of Labrador is weighted toward goods-producing and seasonal industries. The main source of employment by industrial sector in 2006 was agriculture and other resource-based industries (including mining) which employed 42 percent of the area's population (Figure 4.22). Other

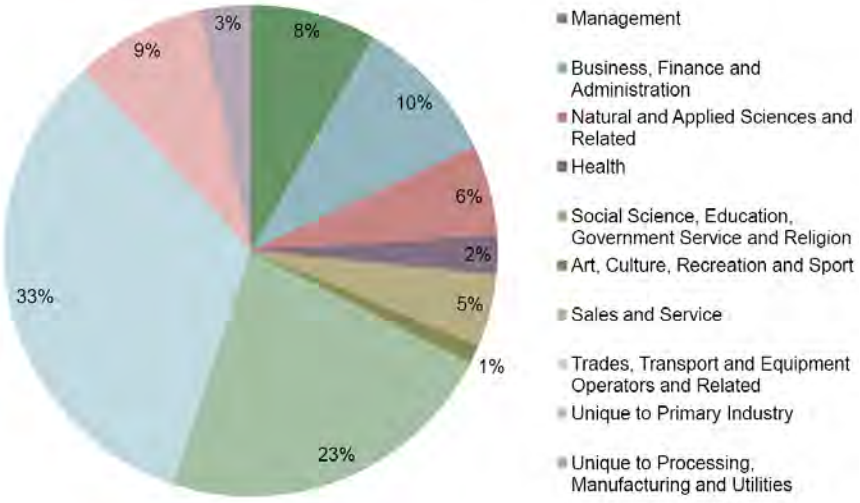
services and retail trade employed 15 percent and 13 percent of the population, respectively, while health care and construction each employed 6 percent of the area's residents. Few Labrador West residents worked in wholesale trade (3 percent), manufacturing (2 percent) or finance and real estate (2 percent) (Statistics Canada 2006).



Source: Statistics 2006

Figure 4.22 Labour Force by Industry, Labrador West, 2006

The main occupations of residents of Labrador City and Wabush are trades, transport and equipment operation (33 percent) and sales and service (23 percent) (Figure 4.23). Occupations unique to primary industry and positions in business, finance and administration are held by nine percent of the area's population (Statistics Canada 2006).

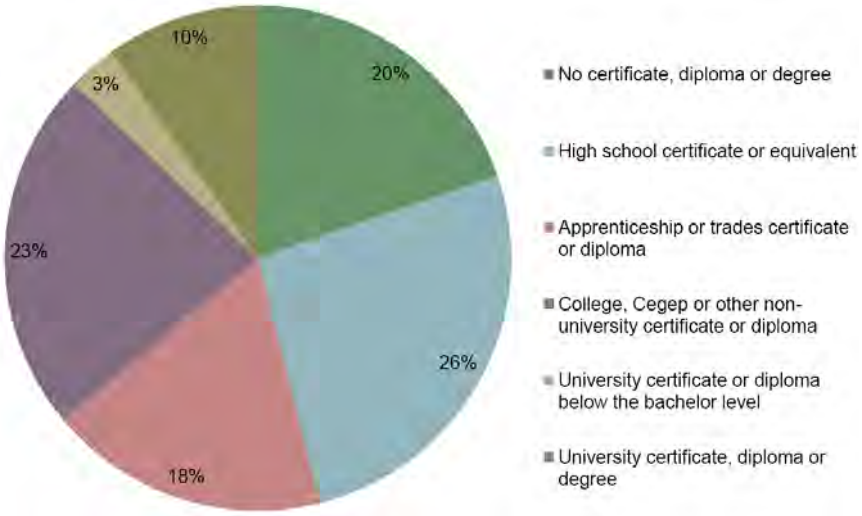


Source: Statistics 2006

Figure 4.23 Labour Force by Occupation, Labrador West, 2006

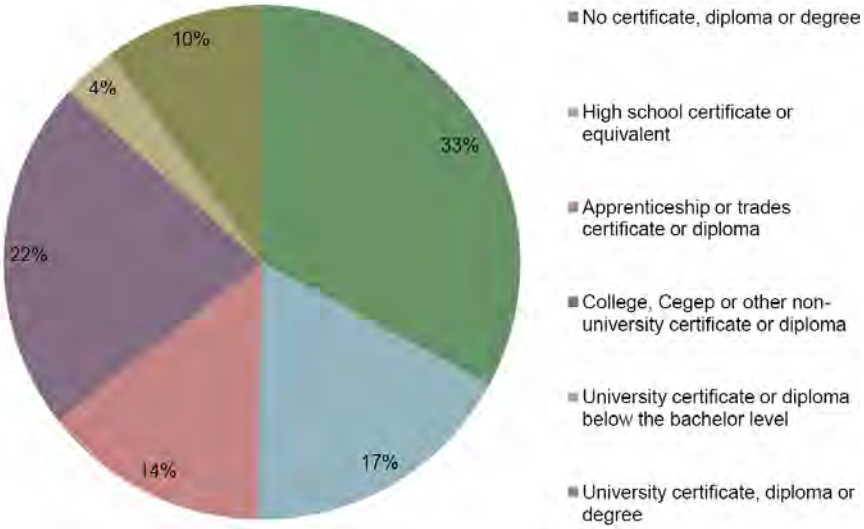
In Labrador West, approximately half of the population (54 percent) has some form of post-secondary training, while only 20 percent have less than a high school education (Figure 4.24). Thirteen percent

of Labrador West residents have a university degree, and an additional 23 percent hold a post-secondary certificate or diploma. In Upper Lake Melville ten percent of the population holds a university degree, and 33 percent have not completed a high school education (Figure 4.25; Statistics Canada 2006).



Source: Statistics 2006

Figure 4.24 Education Level, Labrador West, 2006



Source: Statistics 2006

Figure 4.25 Education Level, Upper Lake Melville, 2006

4.3.3.3 Business

Western Labrador

The business community of Labrador West includes 311 companies, approximately two percent of all businesses in the Province (Statistics Canada Business Register). Most of them have one to four

employees (Table 4.19). These businesses, categorized by North American Industrial Classification System (NAICS) Industry Code, are presented in Table 4.20.

Table 4.19 Number of Businesses by Employment Size Range, Hyron Regional Economic Development Corporation, December 2006

Employment Size Range	Number of Businesses
1-4	139
5-19	121
20-99	43
Total	311
Source: Statistics Canada Business Register	

Table 4.20 Number of Businesses by North American Industrial Classification System Code, Hyron Regional Economic Development Corporation, December 2006

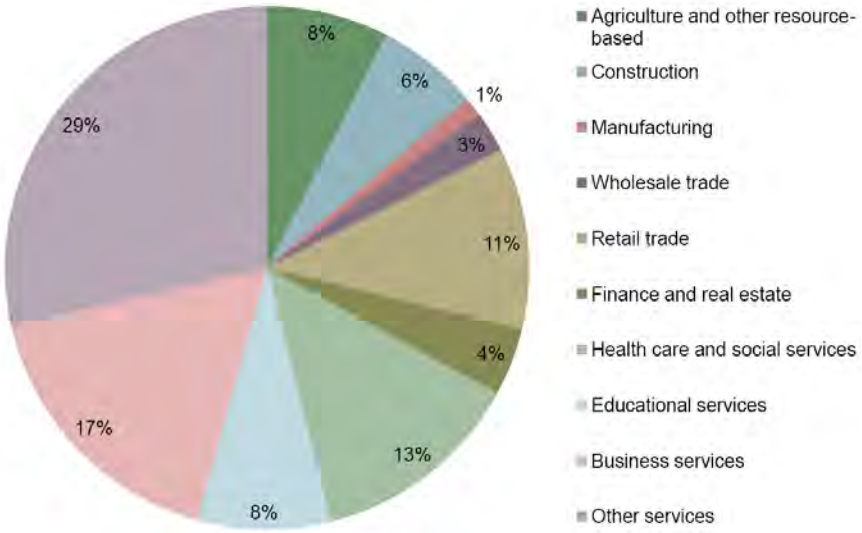
NAICS Industry Code	Number of Businesses
Agriculture, Forestry, Fishing and Hunting	X
Mining and Oil and Gas Extraction	6
Utilities	X
Construction	21
Manufacturing	7
Wholesale Trade	25
Retail Trade	64
Transportation and Warehousing	17
Information and Cultural Industries	5
Finance and Insurance	7
Real Estate and Rental Leasing	16
Professional, Scientific and Technical Services	10
Management of Companies and Enterprises	X
Administrative and Support, Waste Mgmt, and Remediation Services	16
Educational Services	X
Health Care and Social Assistance	26
Arts, Entertainment and Recreation	8
Accommodation and Food Services	27
Other Services (Except Public Admin.)	45
Public Admin	4
Total	**311**
Economics and Statistics Branch (Newfoundland and Labrador Statistics Agency) http://www.stats.gov.nl.ca/Statistics/Trade/PDF/BR_Zone_NAICS_2006.pdf	

The major employers in Labrador West include IOC, which employs more than 2,000 individuals in Labrador City and Sept-Îles, Wabush Mines, with 300 to 400 employees, and the provincial government, including healthcare workers, education employees, and other government employees (B. Jerrett pers. comm.).

Upper Lake Melville

In 2006, 5,035 people aged 15 and over were employed in Upper Lake Melville. The main sources of employment, by industry (Figure 4.26), were Business Services, which employed 860 people, Health Care and Social Services (660), Retail Trade (565) and Other Services (1,435). There were few people employed in Finance and Real Estate (280), Wholesale Trade (125) or Manufacturing (60). The main occupations of Upper Lake Melville Area residents were Sales and Service (1,420), Trade, Transport,

and Equipment Operation (970), and Business, Finance and Administration (875) (Figure 4.26; Statistics Canada 2006a).



Source: Statistics 2006

Figure 4.26 Employment by Industry, Upper Lake Melville, 2006

Upper Lake Melville is the government service centre for Labrador. Offices of many provincial and federal government departments are located and staffed in Happy Valley-Goose Bay. Regional governments and Aboriginal groups also provide opportunities for employment in the area. The main employers and number of employees for each are listed in Table 4.21.

Table 4.21 Major Employers and Number of Employees, Upper Lake Melville

Employer	Number of Employees
Regional Agencies	
Labrador-Grenfell Regional Integrated Health Authority	370
Labrador School Board and six public schools	192
College of the North Atlantic	125
Regional Governments and Aboriginal Groups	
Sheshatshiu Innu First Nation and Social Services	214
Town of Happy Valley-Goose Bay	51 permanent and 30 seasonal
Nunatsiavut Government	53
Labrador Métis Nation	12 permanent and 4 seasonal
Private Employers	
SERCO	350-400 full-time and seasonal
Vale Inco	250
Woodward's Group of Companies	200 full-time and seasonal
NorthMart and affiliated businesses	130
Terrington Consumers Co-operative	47
Labrador Friendship Centre	32 permanent and 40 seasonal
Source: CLEDB 2006.	

Historically, the main employer in Upper Lake Melville has been 5-Wing Goose Bay, the military base and has been the most important driver of the economy. Currently, it employs approximately 400 civilians and 100 military personnel and in 2006-07, total wages and salaries were estimated at $14.9 million (AMEC Earth and Environmental Ltd. and Gardner Pinfold 2008). The largest employer

associated with the base is SERCO, providing base operation services, including maintenance and catering. SERCO employs approximately 350 of the 400 civilians. Spending by those employed in base-related activities has also had beneficial employment multiplier effects on the local retail sector (CLEDB 2006).

As of 2006, there were 329 businesses in Upper Lake Melville (Table 4.22), representing 35.8 percent of businesses in Labrador. The majority of businesses in the Upper Lake Melville Area (145) were small, with one to four employees. There were 42 businesses with 20 to 99 employees (Newfoundland and Labrador Statistics Agency 2007a).

Table 4.22 Number of Businesses, Upper Lake Melville, 2006

Industry	Upper Lake Melville
Agriculture, Forestry, Fishing and Hunting	x
Mining and Oil and Gas Extraction	-
Utilities	-
Construction	40
Manufacturing	9
Wholesale Trade	10
Retail Trade	77
Transportation and Warehousing	14
Information and Cultural Industries	x
Finance and Insurance	6
Real Estate, Rental and Leasing	15
Professional, Scientific and Technical	16
Management of Companies and Enterprises	x
Administrative and Support, Waste Management and Remediation	9
Educational Services	6
Health Care and Social Assistance	50
Arts, Entertainment and Recreation	10
Accommodation and Food Services	34
Other Services	28
Public Administration	5
Source: Newfoundland and Labrador Statistics Agency 2007a Note: x = data not available	

The majority of businesses in the area fall into the in the same five sectors as for the Province and Labrador as a whole, with construction firms ranking third by number. At least a quarter of all local firms are self-described as tourism businesses (CLEDB 2007).

4.3.4 Communities

This section describes the current situation and recent trends with respect to housing, health care, education, recreation, transportation, utilities and security services in Labrador West and Upper Lake Melville.

4.3.4.1 Housing

Labrador West

In Labrador City, the number of occupied dwellings increased by 3.2 percent between 1991 and 2006, from 2,695 to 2,780. In 2006, 78.8 percent of these were owned and 21.4 percent were rented. The

average value of a home in Labrador City in 2006 was $107,604 and the average monthly rent was $521 (Statistics Canada 2006).

Between 1991 and 2006, the number of occupied private dwellings in Wabush increased from 680 to 690 (1.5 percent). The majority (84.1 percent) were owned and 15.2 percent were rented in 2006. The average value of a home in Wabush was $86,216 in 2006 and average monthly rent was $401 (Statistics Canada 2006).

Upper Lake Melville

The number of occupied private dwellings in the Upper Lake Melville increased from 2,820 in 1991 to 3,130 in 1996, and rose again to 3,180 in 2001. In 2006, the number decreased to 3,130, of which 1,870 (59.7 percent) were owned and 1,145 (36.6 percent) were rented. Most occupied dwellings were in Happy Valley-Goose Bay and most of those were single detached homes (Statistics Canada 2006a).

Happy Valley-Goose Bay had 2,725 occupied private dwellings, 59.4 percent of which were owned and 40.1 percent rented. Of the total occupied dwellings, 61.8 percent were single detached homes, 18.2 percent were semi-detached and 5.7 percent were apartments. In 2006 the average value of owned dwellings in Happy Valley-Goose Bay was $133,504 and median monthly rent was $611 (Statistics Canada 2006a).

4.3.4.2 Healthcare

Labrador West

Facilities and Services

The Captain William Jackman (CWJ) Memorial Hospital, located in Labrador City, is a fully accredited health facility which serves Labrador West. It has 20 beds, six of which are designated long-term care beds for levels three and four nursing care. Fourteen beds are for acute care. Inpatient units provide care to medical, surgical, obstetrical, pediatric, respite, palliative and intensive care patients. Maternity care is provided by family physicians and nurses.

The hospital is served by six family physicians, a general surgeon, and an anaesthesiologist. There are also a number of visiting specialists who come to the hospital on a regular basis (Labrador-Grenfell Health 2007). There are two dentists in the area with one other who visits for two weeks each month (O. Simpson, pers. comm.).

The 2008 provincial budget includes plans to spend $59 million on construction of a new Labrador West Health Centre to replace the CWJ. This is expected to be complete in 2011 (NLDF 2008).

Wabush Medical Clinic

There is a Medical Clinic in Wabush which is staffed by one doctor, who is also the physician for Wabush Mines.

Community Service Programs

Labrador-Grenfell Health has a Child, Youth and Family Services office in Labrador West. It has the mandate to provide child protective intervention services, youth services, adoption services, family and rehabilitative services, community corrections, child care services and residential services (Labrador Grenfell Health 2007).

Mental Health Services are provided at the CWJ. It has two addictions counsellors, one addictions coordinator/officer, 4.5 mental health counsellors as well as the regional mental health and addictions clinical manager. Churchill Falls employs one part time mental health nurse. Wait times for mental health counselling in Labrador City are up to 4 to 6 weeks, as position vacancies are a challenge to the department (Aura Environmental Research and Consulting Ltd., 2008).

Shelters

Hope Haven, a shelter and resource facility for women and children escaping domestic abuse, opened in 2004. The building can accommodate up to 225 women and children each year. It was expected to expand with the addition of ten new affordable housing units during the summer of 2008, but plans were put on hold due to construction delays (CBC 2008c).

Ambulance Service

Labrador-Grenfell Health operates a provincial air ambulance service out of St. Anthony. In addition, it operates road ambulances, has specialized equipment to facilitate medical evacuation by snowmobile and provides physician/nursing escorts and paramedic services (Labrador-Grenfell Health 2007).

The Iron Ore Company of Canada also services Labrador City and surrounding area with an industrial ambulance that serves as a back up to the town's ambulance (A. Johnson, pers. Comm.).

Upper Lake Melville

Facilities and Services

There is one hospital in Upper Lake Melville, the Labrador Health Centre in Happy Valley-Goose Bay. The Labrador Health Centre offers full diagnostic and rehabilitative services and it is the referral centre for the community clinics in North West River, Mud Lake and Sheshatshiu. It is equipped with 26 beds and has a 24-hour Emergency Department, as well as out-patient clinics. When fully staffed, the Labrador Health Centre has 12 full-time physicians.

Specialists at the hospital include a general surgeon, an anaesthetist, and an obstetrician and gynecologist. Special clinics offered by the hospital include a well-woman clinic and several clinics offered by visiting specialists (D. Rashleigh, pers. comm.).

There is one long-term care facility in Upper Lake Melville. The Harry L. Paddon Memorial Home in Happy Valley-Goose Bay offers Level 2, 3, and 4 nursing care to residents (T. Dyson, pers. comm.). The Paddon Home has 29 rooms, including seven single-occupancy, 20 double-occupancy, one respite and one special care. A senior citizens' home located on the grounds of the Paddon Home is staffed by registered nurses, licensed practical nurses and personal care attendants on a 24-hour basis. Seniors' care is supplemented by visiting doctors and other services are available from various visiting professionals (Healthy Newfoundland and Labrador ND). The Paddon Home is more than 30 years old and not designed for patients with high care needs. In 2003 a need was identified to construct a new long-term care facility in Happy Valley-Goose Bay (NLDLAA 2006) which is under construction and should be completed in 2009.

Mental health and addictions services are located in the Labrador Health Centre and are staffed by a regional director, an addictions counsellor, an addictions coordinator, four mental health counsellors, an adolescent services coordinator and a community youth network coordinator. The Happy Valley-Goose

Bay office is primarily responsible for services in other communities in Labrador, with the exception of Labrador City and Wabush.

Shelters

Libra House, located in Happy Valley-Goose Bay, has 10 beds and provides support programs and safe shelter for women and children in Upper Lake Melville and those from North Coast Communities. In Sheshatshiu, the Nukum Munik Shelter provides 24-hour service and is funded by Indian and Northern Affairs Canada, the CMHC, and is sponsored by the Sheshatshiu Innu Band Council. Both shelters are sufficient to meet current demand, but are frequently at capacity.

Public Health

The Public Health Unit in the Labrador Health Centre is responsible for providing health clinics to the public including childbirth education, postnatal, child health and school health. It employs three public health nurses. It also employs a discharge planner and community supports coordinator, a regional home nursing coordinator, and a full-time communicable disease control nurse. A full-time medical officer of health, a regional cervical screening coordinator, a regional health promotion coordinator and a regional director are also on staff. The Public Health Unit is presently recruiting another continuing care nurse due to increasing demands related to acute care services (T. Dyson, pers. comm.). Labrador-Grenfell Health, under the direction of the medical officer of health, also offers a variety of programs that are aimed at health protection. Programs include Environmental Health, Communicable Disease Control, and Health Emergency Management (Labrador-Grenfell Health 2007).

Emergency Services

The Labrador Health Centre in Happy Valley-Goose Bay has an Emergency Department that is open 24 hours a day, seven days a week. On average, the Emergency Room sees 60 clients in a 24-hour period and approximately one-third of these are seen during the day (S. Jesseau, pers. comm.) Labrador-Grenfell Health operates a provincial air ambulance service out of St. Anthony on the Northern Peninsula and the Labrador Health Centre has its own plane in Happy Valley-Goose Bay to move patients to and from the Labrador coast. Labrador-Grenfell Health also operates road ambulances, has specialized equipment to facilitate medical evacuation by snowmobile and provides physician and nursing escorts and paramedic services (Labrador-Grenfell Health 2007).

The Labrador Ambulance Service in Happy Valley-Goose Bay is privately owned and operates two vehicles that service Happy Valley-Goose Bay and Mud Lake (albeit, in the latter case, only once patients have been transported across the river). The Labrador Ambulance Service is staffed by nine emergency response technicians, two of whom are full-time. The Service responded to 743 calls in 2007, up from 685 calls in 2004. Labrador Ambulance Service personnel believe that they could support additional demands (J. Squire, pers. comm.; J. Stacey, pers. comm.).

North West River has one ambulance, which is operated by the Labrador Health Centre, to serve people in North West River and Sheshatshiu. 5-Wing Goose Bay also has an ambulance that responds only to airfield emergencies.

4.3.4.3 Education

Labrador West

Childcare and Early Childhood Education

The one early child care facility in Labrador West is located in Labrador City. Wee College Childcare Centre accepts children aged 2 to 6 years and can accommodate 32 children on a part-time basis (Government of Newfoundland and Labrador, Department of Health and Community Services 2004).

Primary, Elementary and High School

There are four schools in Labrador City and Wabush (Table 4.23). Three are managed by the Labrador School Board and one is managed through the Conseil Scolaire Francophone Provincial de Terre-Neuve-et-Labrador. Between the 2000-01 and 2007-08 school years, the total student enrolment in Labrador West increased by 8.9 percent, from 1,387 to 1,510. During that time, the number of full-time teacher equivalents increased by only 0.3 percent (Newfoundland and Labrador Statistics Agency 2008). The Labrador School Board has had problems with the recruitment and retention of teachers (The Aurora, 2007a).

Table 4.23 Schools, Enrolment and Number of Teachers, Labrador City and Wabush, 2007-08

School	Location	Grades	Enrolment 2007-08[A]	Full-Time Equivalent Teachers 2007-08	Pupil-Teacher Ratio	School Capacity
A.P. Low Primary	Labrador City	K-3	402	24.0	14.7	600[B]
Menihek High	Labrador City	8-12	594	35.5	17.1	800[C]
Centre Educatif L'ENVOL	Labrador City	K-8, 10, 12	31	4.0	7.8	
J. R. Smallwood Middle	Wabush	4-7	485	30.8	15.3	1000[D]

[A] T. Pye pers. comm.
[B] S. Kennedy pers. comm.
[C] L. Simmons pers. comm.
[D] H. Costa pers. comm.

Post-Secondary

Post-secondary education is available in Labrador West through the College of the North Atlantic, which has a campus in Labrador City. Approximately 200 full-time and part-time students are registered there each semester (Table 4.24). An additional 200 students participate in continuing education evening courses (College of the North Atlantic 2008). The Labrador West CNA campus is the only campus in the Province to offer a two-year Mining Technician program and has been designated CNA's Mining Centre of Excellence. In 2007, a millwright and an electrical program began to be offered. In 2008, a welder program was added to the campus' trades offerings.

Table 4.24 College of the North Atlantic Enrolment by Program, Labrador City Campus, 2008/2009

Trade Program	Number of Seats, 2008	Capacity
Welder	15	15
Construction/Industrial Electrician	16	16
Industrial Mechanic (Millwright)	16	16
Mining Technician (1st-year)	33	60
Mining Technician (2nd year)	66	75
Adult Basic Education	18	18
CAS Transfer: College- University	20	60
Engineering Technology (First Year)	5	30
Total Number of Students	**189**	**290**
Source: R. Sawyer pers. comm.		

The Government of Newfoundland and Labrador has allotted $18.1 million to build a new facility for the College of the North Atlantic in Labrador City (Government of Newfoundland and Labrador 2008). The building of the new facility will begin in late spring or early summer 2009 and will be finished in September 2010.

There is one private training institution, RSM Safety Institute, Inc., in Labrador City. It is a subsidiary of RSM Mining Services and offers 40 to 50 occupational health and safety training services for the mining and construction industries. These include Accident Investigation, Forklift operation and Safety, Excavation and Trenching Safety and Safety for Supervisors. Class sizes at the Institute range from one to 40 participants, depending on the type of course and time of year. Courses are offered on a monthly schedule but are also available on an as-needed basis and typically are no longer than two days. Courses are generally offered in English, and some are offered in French (K. McCarthy, pers. comm.; K. Lee, pers. comm.).

Upper Lake Melville

Primary, Elementary and High School

There are six primary and secondary schools in Upper Lake Melville, including one francophone school (Table 4.25). Four are in Happy Valley-Goose Bay, while North West River, Sheshatshiu and Mud Lake each have one. Kindergarten through Grade 12 is offered in all of the communities except Mud Lake, which provides only Kindergarten through Grade 9 (Our Labrador 2004). The schools in the area have a total enrolment of 1,901 and the physical capacity to accommodate 2,340 students (Table 4.25).

Table 4.25 Student Populations, Primary and Secondary Schools, 2006 to 2007

School	Location	Grades	Service Areas	Number of Registered Students	Physical Capacity of School	Number of Full-time Equivalent Teachers
Peacock Primary	Happy Valley-Goose Bay	K-3	Happy Valley-Goose Bay	394	500	25
Queen of Peace Middle School	Happy Valley-Goose Bay	4-7	Happy Valley-Goose Bay	425	525	29
Mealy Mountain Collegiate	Happy Valley-Goose Bay	8-12	Upper Lake Melville Area	594	700	36
Lake Melville School	North West River	K-12	North West River and Sheshatshiu	118	200	11
Mud Lake School	Mud Lake	K-9	Mud Lake	4	15[A]	1
Peenamin Mackenzie School	Sheshatshiu	K-12	Sheshatshiu	351	400	34.5
École Boréale de Goose Bay	Happy Valley-Goose Bay	K-12	Happy Valley-Goose Bay and Sheshatshiu	15	N/A	3
			Total	**1,901**	**2,340**	**139.5**

Note:
[A] The capacity of the school is 15 students, depending on the number of grades being taught in a given academic year.
Source: Newfoundland and Labrador Statistics Agency 2008.

The 2007 provincial budget includes $4 million to construct a new school in Sheshatshiu and $1.3 million to replace the francophone school in Happy Valley-Goose Bay (NLDF 2007d).

Post-Secondary

Each year, the Happy Valley-Goose Bay campus of the CNA admits approximately 300 full-time students in a variety of programs, including Adult Basic Education, Automotive Service Technician and Office Administration (Table 4.26).

The CNA has recently expanded its Happy Valley-Goose Bay campus by adding six classrooms and a new library. The Labrador Institute is also co-located on the CNA campus. These changes will allow CNA to accommodate 200 additional students and will add to its overall service capacity to the Upper Lake Melville area (W. Montague, pers. comm.).

Table 4.26 College of the North Atlantic, Enrolment by Program, Happy Valley-Goose Bay Campus, 2005/2006

Program	Number of Students
Adult Basic Education	51
Office Administration	12
Office Administration (Executive)	10
Computer Support Specialist	5
Early Childhood Education	10
Millwright/Industrial Mechanic	16
Welding	15
Automotive Service Technician	16
Heavy Duty Equipment Technician	17
Carpentry	10
Construction/Industrial Electrical	14
Integrated Nursing Access	17
Comprehensive Arts and Sciences: Transition [A]	31
Comprehensive Arts and Sciences: College University Transfer	32
Orientation to Trades and Technology	15
Total [B]	**271**

Source: S. Cochrane, pers. comm.
Notes:
[A] This program is for students that graduate from high school but may not have the requirements to get into a program
[B] These do not include figures for Adult Basic Education for the coastal Learning Centres, other contract programs, or advanced trades training.

4.3.4.4 Recreation

Labrador West

There are a number of indoor recreational facilities in Labrador City and Wabush. The Labrador City Arena is a gathering point for recreation in Labrador City. The building can accommodate 1,800 people and it has one rink which hosts large tournaments, games and activities. It has five dressing rooms, a meeting room and is also home of the Polaris Figure Skating Club and Labrador West Minor Hockey Association. Wabush also has an arena that is used by the Wabush Figure Skating Club, Labrador West Minor Hockey, Recreational and Olympic Hockey (Labrador West 2008). Other indoor recreational facilities in Labrador City and Wabush include the Carol Lake Curling Club and the Mike Adam Recreation Complex.

Outdoor activities are also popular in Labrador West as it has a number of walking trails, softball fields, soccer pitches and Labrador's only 18-hole golf course. The Jean Lake recreational area in Wabush is used extensively by local organizations for their outings. Outdoor sport clubs in the area include the Menihek Nordic Ski club and the White Wolf Snowmobile Club (Labrador West 2008).

Upper Lake Melville

Happy Valley-Goose Bay has indoor and outdoor recreation facilities. NLDTCR operates the Labrador Training Centre in the town which houses the only swimming pool in Eastern Labrador, a gymnasium which is used for numerous community activities, a fitness room, and a judo room. Other sport facilities in Happy Valley-Goose Bay include a 1,000 seat arena, soccer and softball fields operated by the Town

Council and four school gymnasiums (DND 2008). The Amaruk Golf and Sports Club operates a nine-hole golf course in the Summer.

5-Wing Goose Bay also has recreational facilities, including a full-scale gymnasium, an exercise room, two squash courts, a fully equipped weight room and two sauna baths. Other recreation facilities administered by the Base include a 10-bay auto hobby shop, a wood hobby shop and a softball field. Cultural recreation opportunities have also been increased with the development of a new theatre located adjacent to the new high school.

4.3.4.5 Transportation

Labrador West

Roads

The Trans Labrador Highway (TLH) is the primary public road in Labrador. Phase I of the TLH (Route 500) runs between Labrador West and Happy Valley-Goose Bay. In Labrador West it connects with Quebec Route 389, which runs 570 km north from Baie-Comeau to the Quebec-Labrador border. This section of the TLH is a two-lane gravel highway between Labrador City and Happy Valley-goose Bay. It has a service level of "A" (free-flowing traffic), with a capacity to carry 1,000 vehicles per hour. Currently, the highway carries 200 vehicles per day (D. Tee, pers. comm.).

The 2007-08 provincial budget allocated $15 million to commence hard-surfacing of Phase I of the TLH. In June 2007, tenders were issued to widen three sections of road in preparation for hard-surfacing, including a section in Labrador West and a section from Churchill Falls to the Churchill Falls Airport. Crews managed to widen 37 km of road and complete 1.8 km of hard-surfacing by March 31, 2008 (Newfoundland and Labrador Department of Transportation and Works 2008).

Airport

Labrador City and Wabush are serviced by the Wabush Airport, which is located within 5 km of each town's centre. A number of air carriers operate scheduled flights, including Air Labrador, Air Canada Jazz and Provincial Airlines Ltd. (Labrador West 2008). The paved runway strip is 1948 m in length.

In 2006, Wabush Airport reported the highest percentage gain in airport passenger movements (16 percent) mainly due to a rise in mining activity. Between 2006 and 2007, the number of passenger movements at the airport in Labrador West increased by 6.2 percent, from 67,180 to 71,344 (Government of Newfoundland and Labrador, Department of Tourism, Culture and Recreation 2007).

Railway

The Iron Ore Company of Canada (IOC) operates the 418-km Quebec North Shore and Labrador Railway (QNS&L), which IOC built to move iron ore to Sept-Îles. It also provides regularly scheduled, year-round, passenger service (NLDTW 2006). In 2005, Tshiuetin Rail Transportation Inc. (TRT) acquired the northern section of the QNS&L Railway line (the Menihek Subdivision), which runs between Emeril Junction, situated on the Trans Labrador Highway, 63 km from Labrador West, and Schefferville, Quebec. TRT now operates this portion of the rail line for passenger and freight rail services (Labrador West 2008).

Upper Lake Melville

Roads

The local road system in Upper Lake Melville links Happy Valley-Goose Bay with North West River and Sheshatshiu. Mud Lake is not accessible by road but can be reached by boat in summer and by snowmobile in winter. The roads in Happy Valley-Goose Bay are paved, as are some in North West River, but those in Sheshatshiu are not.

Construction on Phase III of the TLH, a 280-km section connecting Cartwright Junction and Happy Valley-Goose Bay, is scheduled to be completed in 2009. As a result of these road improvements, established trucking companies may face increased competition from other companies moving into the area (AMEC Earth and Environmental Ltd. and Gardner Pinfold 2008).

Ports

The Port of Goose Bay is on the western end of Lake Melville in an area known as Terrington Basin and has two industrial docks. Infrastructure includes storage sheds, asphalt and fuel tanks and a transhipment warehouse. There is also a substantial area of laydown space. There is a large area of land within easy access of these docks that could be converted to suit a variety of industrial needs.

Terrington Basin cannot handle large freight or passenger vessels and would require significant dredging for expansion of services (CLEDB 2006). The dock receives three to four oil tankers each year and one freighter every two weeks between mid-June and mid-November, which is the current operating season (D. Tee, pers. comm.).

Airports

Both civilian and military aircraft use the Goose Bay Airport, at 5-Wing Goose Bay. Operated by the Goose Bay Airport Corporation, it is one of the largest airports in eastern Canada. A number of air carriers operate scheduled flights, including Air Labrador, Air Canada Jazz and Provincial Airlines Ltd. (which operates Innu Mikun Airlines), as well as Universal Helicopters and Canadian Helicopters (NLDTW 2006).

The airport has two runways, 3,367 m and 2,920 m in length, both capable of handling large aircraft. DND spent approximately $20 million on resurfacing and concrete replacement during the summer of 2006. The airport terminal was constructed in 1972 and has a design capacity of 32,000 people per year, but it is now handling more than three times this capacity. The number of passengers flying into the Goose Bay Airport in 2003 was 83,430 and in 2005, the number increased to 104,612, an increase of 15.1 percent. However, in 2006, only 94,422 passenger movements were recorded for the Goose Bay Airport, a decrease of 9.7 percent from 2005. They increased again in 2007 by 1.6 percent to 95,921 (NLDTCR 2007).

The Goose Bay Airport Corporation has hired a design and engineering firm to complete the plans for an improved and expanded terminal facility at its current location. Construction of the new terminal will begin in April 2009 and should be completed by the fall of 2010. The new facility will be able to accommodate an annual flow of 100,000 passengers, with further expansion capabilities incorporated into the design (G. Price, pers. comm.).

4.3.4.6 Water, Sewer, Solid Waste, Power and Communications

Labrador West

Water

Beverly Lake, which is located northeast of Labrador City, is the Town's only municipal water supply.

The municipal water supply in Wabush comes from Ouananiche Lake, which is located south of the town. The Town of Wabush has a grid distribution network which services approximately 700 households and businesses (Labrador West 2008).

Sewer

The Town of Labrador City maintains two separate primary Sewage Treatment Plants and three sewage lift stations (Labrador West 2008).

The Town of Wabush maintains one primary Sewage Treatment Plant. The town is in the process of upgrading the plant to better serve the residents of Wabush.

Solid Waste

The garbage from both towns is currently sent to an incinerator, however, in accordance with the Province's waste management plan it is scheduled to close by December 21, 2008. A study was commissioned in early 2008 to determine whether Labrador should develop one super-site to accommodate all of the garbage from Labrador West and Labrador East. In the meantime, the Labrador West regional waste management committee is considering setting up a temporary landfill at an old dump site (Morrissey 2008).

Power and Communications

Power is provided to Labrador West by Newfoundland and Labrador Hydro. Labrador City and Wabush are equipped with technological and telecommunications infrastructure with advanced fibre optic cables throughout communities and industrial sites. Internet service is provided to the communities by Sympatico and CRRS (Labrador West 2008).

Upper Lake Melville

Water

Happy Valley-Goose Bay, North West River and Sheshatshiu have piped water systems, while Mud Lake has ground wells that are fed by seepage from the Churchill River. Happy Valley-Goose Bay receives its water from two sources: the Water Treatment Plant and Spring Gulch, each of which provide 50 percent of the water to the town (Town of Happy Valley-Goose Bay 2001). The water system can support a population of about 12,000 people, but is currently serving only approximately 9,150 (S. Normore, pers. comm.).

Sewer

Happy Valley-Goose Bay and North West River have piped sewage systems that serve all dwellings. Most houses in Sheshatshiu and Mud Lake have septic systems. (S. Normore, pers. comm.)

Solid Waste

The landfill in Happy Valley-Goose Bay (3 km north of Goose Bay Airport) has the capacity to last another 12 to 15 years at current use levels. Sheshatshiu and North West River have their own garbage collection services, but use the landfill in Happy Valley-Goose Bay. This may change in the future as the provincial government is in the process of setting up regional landfill sites (S. Normore, pers. comm.).

Power and Communications

Newfoundland and Labrador Hydro provides electricity to all communities in Upper Lake Melville with power generated at Churchill Falls. The communities of Mud Lake, North West River and Sheshatshiu are all part of the Happy Valley-Goose Bay interconnected service area. Aliant Telecom (Aliant) provides telephone service to Labrador through a microwave radio network.

Police and Emergency Response Services

Labrador West

Police services are provided to Labrador City and Wabush by the Royal Newfoundland Constabulary (RNC). In 2007, there were 22 police officers in Labrador West, 18 of whom were male and 4 of whom were female (Statistics Canada 2007).

The Labrador City Fire Department provides fire protection services to that community and answers an average of 60 calls each year (Labrador West 2008). The Town of Wabush operates a volunteer fire department consisting of 28 firefighters. They protect the residents of Wabush and offer backup to the Town of Labrador City. This department also provides services to Wabush Mines and the Wabush Airport.

Upper Lake Melville

The Royal Canadian Mounted Police (RCMP) is responsible for policing Upper Lake Melville and other parts of Labrador, with the exception of Labrador West. The Labrador District RCMP Headquarters in Happy Valley-Goose Bay has a staff of three. The Happy Valley-Goose Bay detachment is staffed by a Sergeant, two Corporals, 11 General Duty Constables, a District Support Services member, two General Investigation Section (GIS) Investigators and a Community Constable. Sheshatshiu is policed by the RCMP with consultation with and input from the community (RCMP 2008).

There are three fire departments in Upper Lake Melville. There is a municipal department in Happy Valley-Goose Bay with 34 fire fighters, 30 of whom are volunteers and four of whom are full-time fire fighters (D. Webber, pers. comm.).

5-Wing Goose Bay also has a fire department operated by DND and staffed by 39 paid fire fighters. It provides 24-hour crash and emergency rescue services and general fire protection services for the Base.

Local Government

Labrador West

Both Labrador City and Wabush are municipalities, each with a mayor and a town council.

Upper Lake Melville

Happy Valley-Goose Bay is an incorporated municipality administered by a mayor, town council and town manager. Mud Lake, 5 km east of Happy Valley-Goose Bay, is a small unincorporated community of around 60 residents administered by a volunteer Local Improvement Committee.

North West River is 33 km northeast of Happy Valley-Goose Bay. It is an incorporated municipality administered by a mayor, town council and town manager or clerk.

Sheshatshiu is approximately 25 km northeast of Happy Valley-Goose Bay and adjacent to the settlement of North West River. It is an Innu community which acquired Federal Reserve status in 2006 and is administered by a Band Council.

4.4 Data Availability and Gaps

The data and information used to describe the existing environmental conditions in the Project area and to inform the environmental effects assessment were obtained by a combination of literature searches and reviews of previous studies, on-site data collection and fieldwork by the Project team, and interviews with experts and local contacts. In general, the information gathered for this assessment is adequate for the purpose of assessing environmental effects and their significance according to the EIS guidelines as set out by the Government of Newfoundland and Labrador. Environmental issues and controls associated with the proposed Project are well understood due to the knowledge accumulated from the previous mining operations at the site as well as the proposed use of proven mine technology and design. Residual environmental effects can therefore be predicted with a generally high degree of confidence. Additional information gathered during subsequent environmental investigations to address any noted data gaps will assist the proponent in refining mitigative measures and management plans.

4.5 Future Environment

The following describes the likely future environmental conditions in the proposed Project area if the Project did not proceed. This information is provided to help distinguish Project-related environmental effects from environmental change due to natural and/or other anthropogenic processes and trends in the Project area.

No substantial changes are expected to occur in the Project area with respect to the existing biophysical environment as a result of natural processes. The Project area has been heavily disturbed by past mining operations (up to 50 percent of the landscape on the James North and James South sites, and up to 90 percent of the landscape disturbed on the Redmond site). Without the Project, this landscape would continue to be a heavily disturbed site with flooded abandoned mine pits, a former rail bed, turning yards and stockpiles of mine waste and uneconomical ore materials. The area has remained heavily disturbed since mining on the site halted in 1982, and it is expected that landscape conditions would remain heavily disturbed in the absence of the Project. Given the reclamation plans (revegetation of the site, grading, removal of infrastructure, etc.), the future environment without the Project could actually contain a more heavily-disturbed landscape than if the Project were to go forward through and including land reclamation.

Some wildlife species in the Project area are subject to natural cycles and will likely undergo some natural changes over the designated time period in the absence of the Project. In the absence of the

Project it is expected that caribou population trends will continue. Air quality in the area is generally good, and in the absence of the Project, air quality could be expected to remain generally the same, perhaps with some marginal improvements resulting from improved air quality regulations and controls in other parts of Canada and the United States that provide some long-range transport of airborne contaminants to the Project area. The effects of climate change on the Project area (as described in Section 6.6) will likely result in changes to the existing environment whether or not the Project goes forward.

Without the Project, current trends in the region's socio-economic environment will continue. The populations of the local area communities will continue to decrease (in the absence of other influences or projects), as has been the trend in recent years.

The construction and expansion of other projects in the region are expected to continue with or without the Project. The environmental effects analyses presented in Chapter 6 of this EIS include consideration of the likely future condition of the environment as a result of these other activities in assessing and evaluating cumulative environmental effects.

5.0 PUBLIC CONSULTATION AND ISSUE SCOPING

The Newfoundland Environmental Assessment Regulations require that, during the preparation of an EIS, the Proponent must meet with interested members of the public in the local area to provide information on the proposed undertaking, and to record and respond to any concerns regarding the environmental effects of the Project. In accordance with this requirement, and as specified in the EIS Guidelines, public information sessions were held as part of the scoping exercise. These were the culmination of a comprehensive program of community engagement initiated by LIM in 2005, prior to the start up of any exploration or development work on the Project (Appendix O).

5.1 Public Information Sessions

5.1.1 Session Schedule

Public information sessions were held from November 26 to 28, 2008 (Table 5.1). As specified in the EIS Guidelines, this saw a session in Labrador West and, as recommended in the Guidelines, one in Schefferville, Quebec. In addition, LIM held a session in Happy Valley-Goose Bay.

Table 5.1 Public Information Session Schedule

Date	Location	Venue
November 26, 2008	Happy Valley-Goose Bay	Hotel North 2, Goose Bay
November 27, 2008	Labrador West	Wabush Hotel, Wabush
November 28, 2008	Schefferville	Community Centre

During the course of its community consultation process since December 2005, the Proponent has held many other public information sessions, and meetings with community and business leaders, in Wabush, Labrador West, Happy Valley-Goose Bay, Schefferville, Sept-Iles and Kawawawachikamach.

Aboriginal consultations are discussed in Section 5.2.

5.1.2 Public Notifications

As required under the provisions of the Newfoundland *Environmental Assessment Regulations*, and as specified in the EIS guidelines, the public information sessions were advertised in local newspapers. Public notifications for the Labrador West session in Labrador West appeared in the *Aurora* newspaper on November 24, 2008, and for the session at Happy Valley-Goose Bay in the *Labradorian* newspaper on November 24, 2008. In addition, public notifications of the Labrador sessions were posted in the Town Halls of Wabush, Labrador City and Goose Bay, as well as at a number of other prominent public areas.

The public notices described the nature and purpose of the information sessions, and stated the date, location, and time of the events. These advertisements also included contact information for the Proponent so that interested members of the general public who were not able to attend could forward any questions or comments that they might have about the Project. (Appendix P)

5.1.3 The Sessions

The public information sessions provided an opportunity for local residents to obtain information on the Project, and to ask questions and raise any issues or concerns that they might have directly with the Proponent. Project representatives in attendance included Terence McKillen (Executive Vice-President, LIM), Linda Wrong (Vice-President Environment and Permitting, LIM) and Joseph Lanzon (Manager Government and Community Affairs, LIM). Mr. Lanzon and Ms. Wrong coordinated the sessions, distributed handouts and recorded any questions and comments raised. Mr. Paul Rideout (Newfoundland and Labrador Department of Environment and Conservation), Chairperson of the Environmental Assessment Committee, was present at the Happy Valley-Goose Bay, Labrador City-Wabush and Schefferville meetings to address questions related to the environmental assessment process.

Each of the sessions began at 7:00 p.m. The sessions in Labrador were conducted in English, while that in Schefferville was conducted in French. Visitors were requested to sign a guest book as they entered the venue, and were given a handout consisting of a summary of the Project (Appendix Q). Participants were encouraged to call the Proponent using a toll-free number or to write by email, mail or fax with any comments, questions or concerns relating to the Project.

The sessions featured a PowerPoint presentation by Mr. McKillen and a series of display panels which provided information on the proposed Project (including its location and development schedule, design details, mining and processing methods, and employment), the environmental assessment process and the existing aquatic, terrestrial and marine environments (Appendix R). This was followed by an informal question and answer session. Following this, attendees were invited to view the information panels, and to ask questions and provide comments on the Project to any of the LIM representatives in attendance. Refreshments were provided at each of the sessions. The sessions continued for as long as members of the public remained.

A debriefing session for the Project representatives was held at the end of each public information session. This gave the team members an opportunity to review discussions from the session, and ensured that all issues, concerns, and questions were recorded.

5.1.4 Attendance

Table 5.2 summarizes the attendance at the information sessions. The number of completed comment sheets includes those completed during the sessions, and those received by e-mail, fax or mail following the events.

Table 5.2 Public Information Session Attendance

Community	Visitor Count	Comments Received
Happy Valley-Goose Bay	25*	Positive interest expressed in: procurement: • business opportunities; • contracting; and • potential employment
Wabush-Labrador City	12*	Statement of positive support from the Mayor of Wabush: • hopes that the provincial government approves the Project in a timely manner; and • attended by miners from Wabush Mines interested in potential work opportunities to offset layoffs.
Schefferville	15*	Statement of positive support by Administrator of Schefferville: • Identified opportunity for Schefferville to be a positive support to the Project while recognizing that it is a Newfoundland and Labrador Project.
Total	**52**	
*Some visitors attended the sessions without signing the guest book.		

5.1.5 Issues and Questions Raised

The issues and questions raised during each of the public information sessions are summarized below.

5.1.5.1 Happy Valley-Goose Bay

Attendees at the Happy Valley-Goose Bay public information session included representatives from the business community, representatives from the Innu Development Corporation, and representatives of individual Innu business. There were a number of questions regarding the business opportunities that might be available to residents of Upper Lake Melville. There were no negative comments made and the general impression received was one of support.

5.1.5.2 Wabush-Labrador City

Attendees at the Labrador West public information session included the Mayor of Wabush, a representative from the Economic Development Bureau, representatives from the business community and individual residents. There were questions regarding the employment and business opportunities that might be available to residents of Labrador West. The Mayor made a very supportive statement for the Project. There were no negative comments and the general impression was one of support.

5.1.5.3 Schefferville

The attendees included the Administrator of the Municipality of Schefferville and representatives from the business community and individual residents. There were questions regarding the business opportunities that might be available to residents of Schefferville. The Municipal Administrator noted that the community wanted to indicate its support of the Project and to advise LIM that, subject to discussion and planning, it was prepared to provide municipal services to the Project.

5.1.6 Summary

The public information sessions indicate that the proposed Project is generally viewed as a positive development for Western and Central Labrador, and in Schefferville. Most of the attendees were relatively well informed about mining in general and about the history of the Project. The majority of the questions asked during the sessions related to the employment and business opportunities, and the specifics of the mining, beneficiation and transportation processes. No bio-physical environmental issues were raised and the potential socio-economic benefits associated with the proposed Project were favourably received.

5.2 Aboriginal Consultations

As part of the consultation process, extensive consultations were held with the Aboriginal communities in the Quebec-Labrador Peninsula. These communities have overlapping land claims issues or traditional rights issues covering this part of western Labrador. Consultations with the aboriginal communities also started in 2005 (Appendix O). They were conducted with:

- The Innu Nation of Labrador representing the Sheshatshiu Innu First Nation and the Mushuau Innu First Nation, respectively located at the communities of Sheshatshiu and Natuashish, Labrador;
- The Innu Nation of Matimekush-Lac John, located at Schefferville, Quebec;
- The Naskapi Nation of Kawawachikamach, located at Kawawachikamach, Quebec; and
- The Innu Nation of Takuaikan Uashat Mak Mani-Utenam, living in the communities of Uashat and Maliotenam, near Sept-Îles, Quebec.

In July 2008, LIM entered into an Impact Benefits Agreement with the Innu Nation of Labrador, replacing an earlier Memorandum of Understanding. This life of mine agreement establishes the processes and sharing of benefits that will ensure an ongoing positive relationship between the LIM and the Innu Nation. In return for their consent and support of the Project, the Innu Nation and their members will benefit through training, employment, business opportunities and financial participation in the Project.

LIM has also entered into memoranda of understanding with the Innu Nation of Matimekush-Lac John and the Naskapi Nation of Kawawachikamach, and is in discussion with the Innu Nation of Takuaikan Uashat Mak Mani-Utenam respecting a similar memorandum of understanding. These memoranda relate to the development of an ongoing positive relationship between LIM and each First Nation relating to the development and operation of the Project.

5.3 Other Consultation

During the course of its community consultation process since December 2005, the Proponent held many other public information sessions, and meetings with community and business leaders, in Wabush, Labrador West, Happy Valley-Goose Bay and St. John's. Similar consultations took place in Schefferville, Matimekush-Lac John, Kawawawachikamach, Sept-Iles, and Uashat Mak Mani-Utenam in Quebec.

5.4 Selection of Valued Environmental Components

Based on the results of the issues scoping exercise described above, a thorough understanding of the Project activities and the existing environment, the requirements of the EIS Guidelines and the professional judgment of the Study Team, the following VECs have been selected for consideration in this EA:

- Fish and Fish Habitat: This includes the physical and biological components of the freshwater environment such as substrate type, water depth, and fish species composition and distribution. Fish habitat has the potential to be adversely affected by Project activities resulting in physical disturbance of the water bodies or through Project effluents. As DFO requires loss of fish habitat to be compensated, a full assessment of the nature and extent of potential Project effects is required.
- Caribou: This will include consideration of woodland and/or migratory caribou and habitat in Newfoundland and Labrador and Quebec. Woodland caribou are protected under both federal and provincial legislation, and any potential Project effects will require full assessment.
- Employment and Business: This will include consideration of hiring policies, training initiatives, employment of under-represented groups, the potential for effects on existing industry and services and the ability of existing infrastructure to service the proposed construction and operation. The provincial government has requested that the Proponent demonstrate a goal of maximizing industrial benefits for the Province and the discussion around this VEC will be important in demonstrating this commitment.
- Communities: This will include the social and physical infrastructure and services of Labrador communities. As required by the EIS guidelines this EA also provides a focus on healthcare.

A description of the environmental assessment methods used to assess the environmental effects of the Project is provided in Appendix S.

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The environmental assessment (EA) methods employed in this EIS are intended to:

- focus on issues of greatest concern;
- address regulatory requirements, including those identified through the Project-specific EIS Guidelines;
- address issues raised by the public and other stakeholders during Project-specific consultation; and
- integrate engineering design, mitigation, and monitoring programs into a comprehensive environmental management planning process.

The approach and methods used for the EIS are based largely on the work of Beanlands and Duinker (1983), the CEA Agency (1994; 1999), and Barnes et al. (2000), as well as the study team's experience in conducting environmental assessments. The EA methods provide a systematic evaluation of the potential environmental effects that may arise from each Project phase (construction, operation, and decommissioning) as well as malfunctions and accidents, with regard to each of the identified VECs. Project related environmental effects are assessed within the context of temporal and spatial boundaries established for each VEC. The evaluation of potential cumulative environmental effects includes past, present and likely future projects and activities that may interact with Project-related environmental effects. The specific steps involved in the environmental assessment for each VEC include:

- determination of the assessment boundaries;
- description of the existing conditions for each VEC;
- identification of potential Project-VEC interactions;
- overview of existing knowledge and mitigation or effects management measures;
- definition of the significance criteria for residual environmental effects;
- assessment of the environmental effects and mitigations or effects management measures;
- determination of the significance of Project residual environmental effects.
- cumulative effects assessment; and,
- identification of any monitoring or follow-up requirements.

Additional information on the methods used to assess potential environmental effects of the Project to the VECs are presented in Appendix S.

6.1 Fish and Fish Habitat

Many of the waterbodies onsite comprise fish habitat and several species of fish are present in the lakes, and streams on and adjacent to the James, Silver Yard, Redmond locations and the interconnecting access roads for the Project. Some of the riparian habitats adjacent to these waterbodies have been modified by previous mining activities.

Despite the historical mining, some areas of fish habitat support fish communities that sustain themselves and interconnect with other communities downstream in the same watersheds were observed. Surveys have identified the current distribution of these species in the waterbodies and riparian habitats associated with the James and Redmond mining activities.

6.1.1 Environmental Assessment Boundaries

Assessment area boundaries for fish and fish habitat are discussed in Section 4.2.4.2.

6.1.2 Existing Fish and Fish Habitat Environment

Section 4.2.4 summarizes the existing conditions for fish and fish habitat and the existing fisheries in the Project area. The assessment in this section focuses on fish and fish habitat that may be affected by the Project.

6.1.3 Potential Project-Fish and Fish Habitat Interactions

The potential Project interactions with fish and fish habitat are expected to be very limited as there is no direct construction or operation related impacts to fish-bearing waterbodies if standard and enhanced mitigations are applied. Potential interactions that could have an adverse effect on fish and fish habitat by the Project phases are summarized below.

6.1.3.1 Construction

Site clearing and construction activities near waterbodies, have the potential to disturb riparian vegetation and have erosion or dust introduce sediment into fish-bearing waters.

No new stream crossings are required for the construction and operation phases. No infilling of fish-bearing waterbodies are required. No materials (waste rock or reject fines) are to be deposited into areas of direct fish habitat.

Discharges to fish habitat waters have the potential to contain deleterious substances such as hydrocarbons, suspended solids, and various potentially toxic substances (e.g., metals, solvents, or concrete products). No such discharges are planned

6.1.3.2 Operation

Again, operational discharges are similar to those outlined for the construction period, with the addition of substances related to operation (e.g., reject fines and blast residue (ammonia)). The potential for acid rock drainage has been determined through testing to not be present in the Project area (Section 4.1.4.6).

Water withdrawal from fish-bearing waters has the potential to dewater habitats and affect survival or migration. There are no plans to withdraw water from the naturally-occurring surface water systems in the Project area. The groundwater dewatering system at the James Deposit is designed to pull the water table down enough to reduce groundwater accumulation in the active pits. This will also affect the water table, which feeds the two springs that maintain flows in the unnamed tributary on the James Property. The tributary downstream of the Project development footprint contains fish habitat (See Appendix N).

Beneficiation washwater will be directed to the historical Ruth Mine Pit, which will serve as a settling pond. Currently, existing pit water from Ruth Pit flows to James Creek. As shown in Figure 3.8 the added volume to Ruth Pit is an estimated 20 percent of the baseflow in James Creek and will only be added during the seven months of operation each year for an estimated total operation period of 5 years. This increase in flow is not expected to affect fish habitat in James Creek.

Blasting near fish-bearing waters has the potential injury fish or developing eggs and fry; however none is planned during the construction or operation of the Project.

6.1.3.3 Decommissioning

A summary of the potential interactions between the Project and fish and fish habitat is shown in Table 6.1.

Table 6.1 Potential Project-VEC Interactions for Fish and Fish Habitat

Project Activities and Physical Works	Potential Environmental Effects	
	Stress, Avoidance, or Mortality	**Degradation of Habitat**
Construction (Project activities in 2009)		
Site Preparation (grubbing, clearing, and excavating)	X	X
Placement of Infrastructure (reinstatement of rail spur, utilities)		
Placement of Equipment and Buildings		
Operations (on-site power generation, solid waste, grey water, human presence, and transportation)	X	X
Employment and Expenditures	X	
Operation (Project activities starting in 2010)		
Iron Ore Extraction (excavation – mechanical, blasting)	X	X
Iron Ore Beneficiation (crushing, washing, screening, stockpiling, hazardous and mining waste disposal)	X	X
Stormwater and Washwater Management	X	X
Transportation (on-site trucking, rail loading)		
Operations (on-site power generation, solid waste, grey water, human presence)	X	X
Employment and Expenditures	X	
Decommissioning		
Removal of Facilities and Equipment		
Site Reclamation (grading, re-vegetation)	X	X

Existing Knowledge and Mitigations

DFO has issued *Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador* (Gosse et al 1998), which provides a concise summary of the effects of poor environmental practices and the protective measures, or mitigations that protect fish habitat by limiting adverse effects from

construction, operations, and decommissioning near waterbodies. The implementation of these and other guidelines, in concert with the application of LIM environmental policies and procedures, will mitigate the potential adverse interactions between the Project and fish and fish habitat. The potential effects span the Project phases (construction, operation, and decommissioning) and are described by category rather than phase. The categories that apply to this Project include; direct habitat destruction, pollution prevention, water management, and current and future fisheries.

Direct Habitat Destruction

As stated above there is no requirement for direct habitat destruction through any need to construct or operate in fish-bearing waters as all culverts and stream crossings are in place. No infilling is required for the Project and no materials such as waste rock or reject fines will be deposited in fish-bearing waters.

Blasting activities will be limited in nature as little blasting may be required in the mine pits. All blasting will be distant from fish habitat as per DFO guidelines (Gosse et al 1998; Wright and Hopky 1998), otherwise appropriate precautions will be implemented.

Pollution Prevention

The DFO guidelines detail measures for the control of clearing, grubbing, and the prevention of erosion in nearby waterbodies. These guidelines in conjunction with the maintenance of undisturbed vegetated buffer zones will control potential sediment releases into fish habitats. Other controls include suppression of dust (lift-off from exposed soils and generated from transport and crushing activities), and reduction of suspended solids in drainage channels through the use of geofabric, ditch dams, and proper layout of site drainage. Settling ponds will also be effective in reducing suspended solids being released to the environment.

Other pollutants that could potentially be released into waterbodies include waste water/wash water, metals, blast residue (ammonia), concrete products and minor hydrocarbons from vehicle use. All of these can be controlled under normal circumstances through proper handling and disposal, site management and housekeeping practices, treatment where necessary (e.g., oil/water separators), and adequate emergency spill response equipment and training to address unplanned events.

Water Management

The Project may have the potential to affect fish and fish habitat by the withdrawal and release of dewatering activities. The plan for water management at the James site is comprised of two circuits:

Groundwater dewatering will be conducted continuously to reduce groundwater intrusion to the active mine pits at James. Although the initial groundwater dewatering may have elevated TSS, it is currently designed to incorporate source filtration at the well heads and it is further expected that well water upon full development will be clear. Clear groundwater dewatering will meet provincial water quality regulations and will be released, in part, to the unnamed tributary via a constructed settling pond to feed into the unnamed tributary on the James Property to maintain existing fish habitat. Any extra dewatering water will directed into James Creek, with the groundwater potential being used at the Silver Yard for use in beneficiating the rock.

Pit water with elevated TSS will be pumped from the active pits to a settling pond at the SP1 settling pond area, prior to being pumped to the Silver Yard for use in the beneficiation process and then directed to the Ruth Pit.

There will be a storm water management pond at the Silver Yard to collect and manage site drainage.

Water for the Silver Yard beneficiation may come from two sources; clean water from the groundwater dewatering circuit or residual pit water via the pit water settling pond at the SP1 settling pond area.

This water management plan is designed to protect fish habitat from dewatering activities and the potential of accidental washwater releases.

The Redmond Site will have a much simpler plan as pit dewatering requirements are reduced by a lower water table and that water from the active pit can be pumped directly to an exhausted nearby historical pit (Redmond 2 or Redmond 1) .

Current and Future Fisheries

New developments in previous unpopulated or sparsely populated areas bring two potential pressures on existing fish resources and existing fisheries. First, anytime a new area of wilderness is opened, access is provided for others to come in and pursue the 'new' fishery. In extreme cases, the adult fish stocks can be depleted to the point that future recruitment is in jeopardy. This is not the case for this Project as all roads are already in place and access provided to local fishers.

The second pressure is that Project personnel may pursue angling in the local streams and ponds to a level that again depletes the adult fish stocks. To mitigate this possibly, LIM will implement and enforce a no fishing policy for workers. As the workforce will be accommodated off-site, this policy will be effective in limiting angling pressure on the adjacent streams and ponds.

6.1.4 Environmental Effects Assessment, Management, and Residual Effects Determination

The potential effects of the Project on fish and fish habitat are summarized above by the three phases. Mitigative measures will be applied to the potential effects and the results are the residual effects, which are examined to determine their significance.

6.1.4.1 Residual Environmental Effects Significance Criteria

Residual environmental effects are those which are predicted to affect fish and fish habitat, once mitigation measures have been applied to a Project. Each prediction is described according to:

- geographic extent (site-specific, within the Assessment Area, throughout the Assessment Area and beyond);
- frequency of occurrence (once, infrequently, continuous, not likely to occur);
- duration (less than one generation, over several generations, permanent);
- magnitude (low-no measurable change relative to baseline conditions, moderate-measurable change that does not cause management concern, high-measurable change that does cause management concern);
- reversibility (reversible or irreversible);
- confidence (low or high confidence regarding the significance prediction; and
- likelihood (significant effect is likely or unlikely).

A significant adverse residual environmental effect is one in which the Project would cause a population decline, such that the viability or recovery of the local/regional fish species is threatened.

6.1.4.2 Summary of Residual Environmental Effects Prediction

A summary of the mitigation measures, and the significance of residual effects once mitigation is applied are provided in Tables 6.2, 6.3, and 6.4 for the three phases of the Project. Follow-up and monitoring requirements are indicated near the bottom of each table. An outline of monitoring activities is provided in Section 7.3 Environmental Monitoring and Follow-Up Programs.

Table 6.2 Summary of Residual Environmental Effects for Fish and Fish Habitat: Construction

Mitigation	
• Retain vegetated buffer zones where possible • Sediment control measures (settling ponds, geofabric, ditch dams, dust control) • Proper handling of waste, hazardous waste, waste water, wash water, • Implementation of emergency measures to respond to spills and other accidental events • Pit and site water to Ruth Pit • No fishing by Project personnel	
Significance Determination	
Geographic extent	Within the Assessment Area
Frequency of occurrence	1-2 years
Duration of impact	Less than one generation
Magnitude of impact	Low
Permanence/reversibility	Reversible
Significance	**Not Significant**
Confidence	Not applicable
Likelihood of occurrence	Not applicable
Follow-up and monitoring	
• Effluent monitoring under provincial and federal approvals and regulations	
Note – Confidence and Likelihood of Occurrence are Not Applicable when residual environmental effect is not significant	

Table 6.3 Summary of Residual Environmental Effects for Fish and Fish Habitat: Operation

Mitigation	
• Maintenance flow in Unnamed Tributary (James Deposit) to protect fish habitat • Erosion and sediment control as in Construction • Waste control as in Construction • Implementation of emergency measures to respond to spills and other accidental events • No fishing by Project personnel • No blasting near water • Pit and site water to Ruth Pit • Control of release from Ruth Pit	
Significance Determination	
Geographic extent	Within the Assessment Area
Frequency of occurrence	Continuous
Duration of impact	Over several generations
Magnitude of impact	Low
Permanence/reversibility	Reversible
Significance	**Not Significant**
Confidence	Not applicable
Likelihood of occurrence	Not applicable
Follow-up and monitoring	
• Effluent monitoring under provincial and federal approvals and regulations • EEM under provincial and federal approvals and regulations	
Note – Confidence and Likelihood of Occurrence are Not Applicable when residual environmental effect is not significant	

Table 6.4 Summary of Residual Environmental Effects for Fish and Fish Habitat: Decommissioning

Mitigation	
• Maintenance flow in Unnamed Tributary (James Deposit) to protect fish habitat • Erosion and sediment control as in Construction/Operation • Waste control as in Construction/Operation • Implementation of emergency measures to respond to spills and other accidental events • No fishing by Project personnel	
Significance Determination	
Geographic extent	Within the Assessment Area
Frequency of occurrence	Period of decommissioning
Duration of impact	Less than one generation
Magnitude of impact	Low
Permanence/reversibility	Reversible
Significance	**Not Significant**
Confidence	Not applicable
Likelihood of occurrence	Not applicable
Follow-up and monitoring	
• Effluent monitoring under provincial and federal approvals and regulations • EEM under provincial and federal approvals and regulations	
Note – Confidence and Likelihood of Occurrence are Not Applicable when residual environmental effect is not significant	

6.1.5 Cumulative Environmental Effects

The environmental effects assessment for fish and fish habitat has considered the potential effects resulting from the Project, compared with existing and potential disturbances. Cumulative environmental effects result from other ongoing or foreseeable projects or activities that may interact cumulatively with the effects of the Project. The boundaries for cumulative environmental effects assessment are the same temporal and spatial boundaries for fish and fish habitat as defined above, i.e., the watersheds at the James and Redmond Deposits.

Existing projects, disturbances and activities considered to contribute cumulative effects include activities associated with the development of associated roads and the operation of the TRT railroad. Future projects for this area include the expansion of the existing Elross Lake Iron Ore Mine and the expansion of the current Project to include six additional deposits.

Cumulative effects may accrue from increased use of existing roads and the railway. An expansion of the Project to include the development of other pits at Knob Lake, Houston, Astray Lake, Sawyer Lake, Howse, or Kivivic will lead to increased traffic on the local roads and increased processing at the Silver Yard.

The potential cumulative effects are ones that have been described for the current Project and the same mitigative measures can be applied to reduce adverse environmental effects on fish and fish habitat. A summary of these potential cumulative environmental effects is shown in Table 6.5 along with the anticipated significance.

Table 6.5 Summary of Residual Environmental Effects for Fish and Fish Habitat: Cumulative Effects

Mitigation	
Other projects are subject to applicable Federal and Provincial regulations	
Significance Determination	**Fish and Fish Habitat at James & Redmond**
Geographic extent	Within the Assessment Area
Frequency of occurrence	Continuous
Duration of effect	Over several generations
Magnitude of effect	Low
Reversibility	Reversible
Significance	**Not Significant**
Confidence	Not Applicable
Likelihood of occurrence	Not Applicable
Follow-up and monitoring	
• Monitoring limited to that directly connected with current Project	
Note – Confidence and Likelihood of Occurrence are Not Applicable when residual environmental effect is not significant	

6.2 Caribou

Caribou was chosen as a VEC based on the knowledge that the large and migratory George River Caribou Herd (GRCH) occurs in the Project area on a seasonal basis, although their movements locally are difficult to predict year to year. This large herd has important cultural, recreational and economic benefit for residents and supports an extensive outfitting industry.

There are no other caribou herds that are known to overlap the Project area at this time. Perhaps the nearest other herd of consequence, is the Lac Joseph herd, a sedentary population of Labrador, that exists over 100 kilometres south of the Project area. This population, along with Labrador's other sedentary populations located at greater distances, is designated as "Threatened" by the Committee on the Status of Endangered Wildlife in Canada since May 2002 (COSEWIC 2008; SARA 2008) due the population decrease throughout most of the range. Formerly sedentary caribou existed also to the west and were known as the McPhayden and Caniapiscau Herds (Bergerud et al. 2008).

The sensitivity of caribou to Project interactions and the importance of the GRCH are key reasons why caribou was chosen as a VEC. The George River Herd will be assessed (instead of other herds in Labrador or Quebec) because the Project overlaps with its range (i.e., during winter) and because of its socio-economic and cultural relevance to surrounding communities. The Project may affect caribou through changes in habitat availability or effectiveness, changes in movement patterns, and increased mortality through influences affecting predation/poaching/hunting and vehicle collisions.

A full description of the existing conditions regarding caribou including population, seasonal movements, and habitat use is presented in Section 4.2.2.1.

6.2.1 Environmental Assessment Boundaries

Environmental assessment boundaries for caribou are discussed in Section 4.2.2.1.

6.2.2 Potential Project-VEC Interactions

The potential interactions between the George River Caribou Herd and each Project activity during construction, operations, and decommissioning comprise the scope of the environmental assessment for this VEC (Table 6.6).

6.2.2.1 Construction

Project activities that involve some level of alteration and/or loss of habitat in the vicinity of the deposits may potentially interact with caribou; this includes site preparation, placement of infrastructure, and placement of equipment and buildings. The re-establishment of the Silver Yard as a beneficiation and load out area, construction of pipelines, and rehabilitation of site roads are all examples of activities that will, to some degree, change the already disturbed landscape in the Assessment Area. In addition, the re-establishment of the railway spur line along the existing rail bed increases the area of potential disruption. These activities may result in habitat loss through clearing and removal of vegetation or through disturbance associated with noise, dust and/or visual changes that can displace caribou from suitable habitats that may exist near the development sites. Caribou also react to vehicle movements based on the rate of approach, and proximity (Horesji 1981). In most instances, caribou flee for a short period, once the perceived threat is removed. Potentially temporary or longer-term displacement can result in a functional loss of habitat.

Mortality of caribou related to the Project may occur as a result of collisions with increased rail and vehicular traffic may also occur in association with transportation during operations. Related to this potential interaction, is the possibility of an increased harvest of caribou with the increased accessibility due to road re-establishment, however, there are already numerous roads in the area remaining from the historical development.

Table 6.6 Potential Project-VEC Interactions for Caribou

Project Activities and Physical Works		
Environmental Effects		
	Habitat Change	**Mortality**
Construction (Project activities in 2009)		
Site Preparation (grubbing, clearing, excavating)	X	
Placement of Infrastructure (reinstatement of rail spur, utilities)	X	
Placement of Equipment and Buildings	X	
Operations (on-site power generation, solid waste, grey water, human presence, transportation)	X	X
Employment and Expenditures		
Operation (Project activities starting in 2010)		
Iron Ore Extraction (excavation – mechanical, blasting)	X	X
Iron Ore Beneficiation (crushing, washing, screening, stockpiling, hazardous and mining waste disposal)	X	
Stormwater and Wastewater Management		
Transportation (on-site trucking, rail loading)	X	X
Operations (on-site power generation, solid waste, grey water, human presence)	X	
Employment and Expenditures		
Decommissioning		
Removal of Facilities and Equipment	X	
Site Reclamation (grading, re-vegetation)	X	

6.2.2.2 Operation

During the operation phase of activity, there is further potential for interactions with caribou, especially given the relative length of operation in comparison to the more short-term construction phase. Activities such as blasting and beneficiation will create noise levels that can be expected to have effects on caribou.

6.2.2.3 Decommissioning

During Decommissioning, removal of facilities and equipment will result in further sensory disturbance to caribou in the area. In addition, site reclamation, including grading and re-vegetation, will result in conditions that would eventually be attractive caribou. Following decommissioning, the quality of habitat for caribou will improve over the long-term.

6.2.2.4 Potential Effects and Review of Existing Knowledge

Issues and concerns relating to caribou and the proposed Project can be considered within two effects:

- Change in Habitat – related to the loss or reduction of caribou habitat from site clearing, and/or sensory (e.g. noise) disturbance associated with the presence and operation of people and

equipment. This change in habitat can also result in an alteration of movements and distribution into lower quality habitat, and enhanced susceptibility to predation.

- Mortality – directly related to increased hunting pressure as a result of improved access, and collisions with vehicles or other equipment.

Change in Habitat

Lichen is the primary winter food for caribou and thus influences abundance and distribution (Dzus 2001). Activities (natural and anthropogenic) that cause the removal of this important food source usually result in adverse effects for this species. Foster (1985) reported that lichen may take up to 40 years to recover in post-fire black spruce forests in Labrador. Caribou habitat may require more than 50 years for recovery following fire (Review by Bergerud et al. 2008). Forest harvesting, particularly of stands with relatively high lichen content (e.g., black spruce forest), also directly influence caribou use.

Mining and similar resource development projects on the landscape have been the subject of many assessments in relation to caribou. Bergerud *et al.* (1984) studied eight caribou populations exposed to industrial activities or transportation corridors and found that there was no evidence that disturbance activities or habitat alteration affected caribou productivity. They observed caribou's resilience to human disturbance and also concluded that seasonal movement patterns and extent of range occupancy appear to be a function of population size as opposed to disturbance (Bergerud *et al.* 1984). Weir *et al.* (2007) looked at the impacts of Hope Brook gold mine in southwest Newfoundland on the La Poile Caribou Herd and concluded that prior to mine development, caribou were dispersed throughout the study area, but the number of caribou increased linearly with distance away from the mine over all five seasons during both construction and operation phases. Within 6 km of the mine center, group size and the number of caribou decreased as mine activity increased, indicating an avoidance of the development (Weir *et al.* 2007).

Monitoring of another Newfoundland caribou herd (Buchans Plateau Caribou Herd) during the development of a hydroelectric project in Newfoundland indicated that caribou densities were lower within 3 km of the site during the first year of construction (Mahoney and Schaefer 2002). The lowered caribou densities of this herd (particularly females with calves) within 3 km of the site persisted for at least two years after the construction phase had been completed. In addition to the change in distribution, they concluded that the development caused a disruption of migration timing during the construction phase and longer-term through operations (Mahoney and Schaefer 2002).

In addition to the 4-6 km reported for Hope Brook mine (Weir et al. 2007) and 3 km for the Star Lake hydroelectric development (Mahoney and Schaefer 2002), other reported distances of lower density around developments for caribou (usually females) include: 100-150 m for seismic lines (Dyer et al. 2001); and 1.2-50 km regarding forest harvesting (Chubbs et al. 1993, Smith et al. 2000, Schaefer and Mahoney 2002, Vors et al. 2007). This avoidance is cited as being related to the removal of suitable forage, increased susceptibility to predation particularly by wolves, and/or sensory disturbance associated with the presence of workers and equipment. Studies on the impacts of noise on wildlife indicate that the threshold above which potential negative effects are expected is 90 dBA (Manci et al. 1988). Noises at this level are associated with a number of behaviours such as retreat from the sound source, freezing, or a strong startle response. Harrington (2003) suggested that the most important reactions to noise are difficult to discern and often result in no overt reaction. However, observable reactions provide insight into the potential concerns of noise. Caribou react to noise and display startle reflexes, such as running or ceasing feeding, but these reactions are relatively short-term, resuming normal activities 5 to 15 minutes later (Harrington 2003). It is the extended period of noise that bring

about concerns such as “masking”, or the inability of an animal to hear important environmental signals, such as noises made by potential mates, predators, or prey (Manci *et al.* 1988).

CEAA (1997) stated that noise and human presence associated with development would disturb caribou less than alteration of habitat, and would last for a shorter time - caribou would habituate to routine events. However, disruption of caribou may occur where anthropogenic influences are prolonged in space or time; habituation may not necessarily occur, even if the degree of human activity is not too high (Mahoney and Schaefer 2002). In addition to displacement, change in habitat may also result in the disruption of movements across linear features and/or move them into areas of higher predator exposure (Dyer *et al.* 2002). Additionally, linear facilities (e.g. roads, rail lines, right of ways) may reduce caribou crossings with increasing width, presence of vertical structures, increasing number of vehicles, and/or if aligned adjacent to each other (Curatolo and Murphy 1986, Wolfe et al. 2000, Dyer et al. 2002, Vistness et al. 2004). Bergerud (1996) and Ferguson and Elkie (2004) identify movement, low density distribution and the availability of high quality habitat as important factors for the avoidance of predation.

Mortality

Increased access through the development of expanding road networks or other linear corridors, may result in increased legal and illegal hunting (Dzus 2001, Vistnes and Nelleman 2001). Hunting is normally not considered to be a population limiting factor but could become so if the caribou herd is in decline (Messier *et al.* 1988, Thomas and Gray 2002). Most mortality from hunting is therefore considered additive and not compensatory to other mortality factors (Bergerud et al. 2008). Forest fires may cause change in habitat through the availability of lichen (Foster 1985), but are not expected to cause mortality.

6.2.3 Residual Environmental Effects Significance Criteria

Residual environmental effects are those which are predicted to affect caribou populations, once mitigation measures have been applied. Each prediction is described according to:

- geographic extent (site-specific, within the Assessment Area, throughout the Assessment Area and beyond);
- frequency of occurrence (once, infrequently, continuous, not likely to occur);
- duration (less than one generation, over several generations, permanent);
- magnitude (low to no measurable change relative to baseline conditions, moderate-measurable change that does not cause management concern, high-measurable change that does cause management concern);
- reversibility (reversible or irreversible);
- confidence (low or high confidence regarding the significance prediction; and
- likelihood (significant effect is likely or unlikely).

A significant adverse residual environmental effect is one in which the Project would cause a population decline, such that the viability or recovery of the herd is threatened.

6.2.4 Mitigation Measures

In order to mitigate potential effects of the Project on caribou, activities during all phases of the Project will be planned with two main considerations:

- if in the event caribou occur within the Assessment Area or in the vicinity of Project activities, a set of procedures will be incorporated to avoid encounters with caribou; and
- any activity that may potentially affect caribou habitat or mortality in some manner regardless of whether caribou are actually present.

In terms of reducing encounters with caribou, should animals of the George River Caribou Herd enter the 100 x 100 km block [as indicated by observations, co-ordination with Provincial (e.g. monitoring of satellite collars via the internet) and other stakeholders], management staff would be advised. Should caribou from this herd then approach the Project area (i.e., within 5 km) an advisory would be issued to Project personnel, to be alert and exercise caution. Blasting activities would be delayed if caribou are within 3 km. Encounters between personnel/equipment would be addressed through a non-harassment policy. Specific mitigation measures would include:

- no hunting;
- no pursuit or other chasing, vehicles would yield to wildlife; and
- if in the event blasting was scheduled, this activity would be delayed until caribou are at least 3 km distant.

Other mitigation measures to be implemented with Project activities are outlined in Table 6.7.

Table 6.7 Proposed Mitigation Measures for Caribou

Project Activities	Mitigation Measures
Construction (Project activities in 2009)	Reduce construction activities while caribou are in the Project area.
Site Preparation (grubbing, clearing, excavating)	Clear vegetation in a pattern that does not leave a recognizable trail, where practical. This reduces accessibility and visibility to humans and predators. These activities would be restricted to the physical footprint of the Project. Fire prevention and response procedures, training and equipment will be implemented.
Placement of Infrastructure (reinstatement of rail spur, utilities)	The width, density and length of access roads and rail lines will be minimized. Where possible, any new disturbance will be reduced by locating these facilities adjacent to existing areas of surface disturbance. Ensure that linear facilities such as rail lines and roads are separated by more than 100 m, where practical.
Placement of Equipment and Buildings	Fence hazardous construction areas such as open pits, or any locations with blasting activities
Operations (on-site power generation, solid waste, grey water, human presence, transportation)	Personnel authorized to operate company vehicles will possess a valid driver's license, undergo employee orientation and safety training, and be briefed on seasons of greater risk of wildlife-vehicle collisions All access roads to be limited to Project personnel only. Speed limits of 50 km/hr (daylight) and 30 km/hr (darkness) and wildlife caution signs will be posted and enforced along Project roads and rail lines. Traffic reduction/convoying through sensitive caribou areas such as crossings;

Project Activities	Mitigation Measures
	Installing ramps at strategic locations such as crossings along linear disturbances. A bear-aware waste management plan will be developed and adhered to; reduce the likelihood of bears (predators) in the Project areas. All observations of caribou by staff will be recorded (including observer, time and location) and submitted to wildlife monitors and LIM management to determine appropriate mitigation. Hazardous material handling procedures, training and response in the event of a spill will be implemented.
Employment and Expenditures	Enforce no hunting and firearms policies among all personnel. Use monitors to keep construction staff and management informed on the presence of caribou at the mine site as described above
Operation (Project activities starting in 2010)	
Iron Ore Extraction (excavation – mechanical, blasting)	Delay blasting activities while caribou are within 3 km
Iron Ore Beneficiation (crushing, washing, screening, stockpiling, hazardous and mining waste disposal)	Fence hazardous construction areas such as locations with open pits, or any explosive activities. Fire prevention and response procedures, training and equipment will be implemented. Hazardous material handling procedures, training and response in the event of a spill will be implemented.
Stormwater and Wastewater Management	Ensure materials are handled and disposed consistent with federal and provincial regulations
Transportation (on-site trucking, rail loading)	Personnel operating company vehicles will possess a valid driver's license, undergo employee orientation and safety training, and be briefed on potential for and strategies for avoiding, wildlife-vehicle collisions All access roads to be limited to Project personnel only. Speed limits of 50 km/hr (daylight) and 30 km/hr (darkness) and wildlife caution signs will be posted and enforced along Project roads and rail lines
Operations (on-site power generation, solid waste, grey water, human presence)	A "bear aware" waste management plan will be developed and implemented to reduce the likelihood of bears (predators) in the Project areas. Observations of caribou (and other wildlife) by staff will be recorded (including observer, time and location) and submitted to monitors and LIM management to determine appropriate mitigation.
Employment and Expenditures	Enforce no hunting and firearms policies among all personnel. Use monitors to keep operations staff and management informed on the presence of caribou at the mine site.
Decommissioning	
Removal of Facilities and Equipment	Personnel operating company vehicles will possess a valid driver's license, undergo employee orientation and safety training, and be briefed on potential for and strategies for avoiding wildlife-vehicle collisions. Enforce no hunting and firearms policies among all personnel. Use monitors to keep staff and management informed on the presence of caribou at the mine site. Access roads will be restricted to Project personnel only. Speed limits of 50 km/hr (daylight) and 30 km/hr (darkness) and wildlife caution signs will be posted and enforced along

Project Activities	Mitigation Measures
	Project roads and rail lines.
Site Reclamation (grading, re-vegetation)	Reclamation techniques will emphasize the revegetation of the site with local plants that would encourage growth of caribou winter forage. Fire prevention and response procedures, training and equipment will be implemented. Hazardous material handling procedures, training and response in the event of a spill will be implemented.
N/A- Not Applicable- Project activity is unlikely to have an effect on caribou.	

6.2.5 Environmental Effects Assessment, Management, and Residual Effects Determination

The determination of residual environmental effects examines the potential change in habitat or mortality as a result of the interactions identified in Table 6.6, for each phase of the Project.

6.2.5.1 Construction

There will be a change in caribou habitat as a result of construction activities at the Project site. However, most of the affected area would occur in those immediately adjacent to (or within) already disturbed locations from the previous mining activity. The interaction is further reduced as this portion of the George River Herd range is used seasonally if at all. The measures identified to limit the amount of surface disturbance (e.g. limit the width, density and length of access trails and rail lines) and to implement no harassment policies will reduce the potential amount of physical and sensory displacement associated with the Project during construction. Based on the literature, it is reasonable to assume caribou may avoid cleared areas or active work locations by at least 3 km.

Mortality associated with the construction phase is anticipated to be infrequent and unlikely. Several measures will be in place to restrict personnel from hunting on the property and to restrict others from accessing, should caribou be present. If caribou do enter the work area, vehicle operators will be instructed to yield to all wildlife. Reduced speed limits will be maintained regardless of the presence of caribou. Hazardous work areas such as open pits and steep slopes will be fenced to prevent entry.

6.2.5.2 Operation

No further habitat loss will occur during operation. Sensory disturbance around work areas will continue that could represent at least 3 km avoidance, should caribou enter the area. Linear corridors for vehicle or rail transport would potentially reduce or prevent crossing by caribou depending on the level of activity. Controlled speed limits, yielding to wildlife and no-harassment policies will limit this sensory disturbance. Furthermore, alerts when caribou enter the Assessment Area and cessation of blasting activities if caribou are within 3 km, will limit disturbance during operations.

As with construction, the mitigation measures to reduce the possibility of mortality related to the Project will be in place. Speed limits will be posted and enforced, no harassment policy will remain in place, no hunting in work areas, and access will be restricted to personnel. The co-ordination with Provincial Wildlife Division officials when caribou enter the Assessment Area and possibly approach the Project, allow for advance planning and communication to further reduce the possibility of mortality to the George River Herd.

6.2.5.3 Decommissioning

One of the main objectives of decommissioning will be to restore the work areas to a natural state, including those areas that were previously abandoned by others without remediation. Areas will be sloped and revegetated, or left in a situation that would allow revegetation such that there would be a net gain in available habitat. There will be some ongoing sensory disturbance associated with the site reclamation but this will be temporary. Should caribou be present at the time, a similar avoidance of at least 3 km could be expected.

The same mitigation measures related to the operation of equipment and responsibility of LIM and its workforce regarding wildlife will be in place throughout the decommissioning period. Active work sites will continue to be posted as no hunting areas and staff will abide by the no hunting or other harassment policy. However, once the area is returned to a natural state to the satisfaction of Provincial officials, restrictions to access will be removed.

6.2.5.4 Summary of Residual Environmental Effects Prediction

During construction, the monitoring program and on-site mitigation measures will reduce both the physical extent of activities, and the associated disturbance and possibility of mortality related to the Project. The geographic extent of this activity will be site specific and occur in a continuous manner during this phase. The clearing associated with the Project would take several generations to recover but while measurable, this effect as well as the unlikely possibility of mortality is not at a level that would cause management concern. These effects are considered reversible and are not significant (Table 6.8).

Table 6.8 Summary of Residual Environmental Effects for Caribou Construction

Mitigation	
Monitor movements of GRCH. Reduce speed limits, fencing construction sites, patterns of vegetation clearing, no hunting policy, reduce construction activities while caribou are present	
Significance Determination	**George River Caribou Herd**
Geographic extent	Site-specific
Frequency of occurrence	Continuous (throughout construction)
Duration of effect	Less than one generation
Magnitude of effect	Moderate
Reversibility	Reversible
Significance	Not Significant
Confidence	Not Applicable
Likelihood of occurrence	Not Applicable
Follow-up and monitoring	
See Section 7.3.3	
Note – As residual environmental effect is not significant, description of Confidence and Likelihood of Occurrence is Not Applicable	

The operation phase will also have the same monitoring program and on-site mitigation measures in place as proposed during construction. As there will be no further surface disturbance but sensory disturbance would remain, the geographic extent of this phase will continue to be site specific and occur in a continuous manner. The mine workings associated with the Project, during operations, would take several generations to recover (without mitigation) but while measurable, this effect as well as the unlikely possibility of mortality is not at a level that would cause management concern. These effects are considered reversible and are not significant (Table 6.9).

Table 6.9 Summary of Residual Environmental Effects for Caribou Operation

Mitigation	
Monitor movements of GRCH. Reduce speed limits, fence hazardous work areas, no hunting policy, delay blasting while caribou are present	
Significance Determination	**George River Caribou Herd**
Geographic extent	Site Specific
Frequency of occurrence	Continuous (throughout operations)
Duration of effect	Over several generations
Magnitude of effect	Moderate
Reversibility	Reversible
Significance	Not Significant
Confidence	Not Applicable
Likelihood of occurrence	Not Applicable
Follow-up and monitoring	
See Section 7.3.3	
Note – As residual environmental effect is not significant, description of Confidence and Likelihood of Occurrence is Not Applicable	

Decommissioning activities will be of a relatively short-term nature, and once completed – no further presence of vehicles or personnel will occur. During this relatively brief period, appropriate monitoring and mitigation measures regarding the George River Caribou Herd will remain in place. The surface disturbance during the reclamation and associated sensory disturbance would continue to be site specific in terms of geographic extent. The continuous activities during this phase would result in enhanced conditions for encouraging a return to natural conditions. While the recovery would take several generations, the eventual natural state would be permanent. While measurable, these activities will not be at a level that would cause management concern. The positive outcome of this phase will be reversible in terms of creating natural conditions and are therefore not significant (Table 6.10).

Table 6.10 Summary of Residual Environmental Effects for Caribou: Decommissioning

Mitigation	
Monitor movements of GRCH during decommissioning. Reduce speed limits, and implement no hunting policy during decommissioning only (Section 6.2.4)	
Significance Determination	**George River Caribou Herd**
Geographic extent	Site Specific
Frequency of occurrence	Continuous (throughout decommissioning)
Duration of effect	Permanent
Magnitude of effect	Moderate
Reversibility	Reversible
Significance	Not Significant
Confidence	Not Applicable
Likelihood of occurrence	Not Applicable
Follow-up and monitoring	
No longer required following decommissioning	
Note – As residual environmental effect is not significant, description of Confidence and Likelihood of Occurrence is Not Applicable	

6.2.6 Cumulative Environmental Effects

The environmental effects assessment for caribou has considered the potential effects resulting from the Project, compared with existing and potential disturbances at a regional level. The cumulative

environmental effects assessment considers how other ongoing or foreseeable projects or activities may interact cumulatively with the effects of the Project. The boundaries for cumulative environmental effects assessment are the same temporal and spatial boundaries for caribou as defined above.

The effects of existing projects, disturbances and activities such as the activities associated with the Municipality of Schefferville, the Quebec North Shore & Labrador Railroad, the Iron Ore Company of Canada Mine (operations ceased in 1980 at this location), and the Menihek Dam are captured and reflected in the baseline environment conditions for caribou. Future projects for this area include the construction of the Elross Lake Iron Ore Mine and the possible development of LIM's additional six deposits (Table 6.11).

Table 6.11 Projects and Activities Considered in Cumulative Environmental Effects Assessment

Project	Status
Elross Lake Iron Ore Mine (NMCC): Proponent: New Millennium Capital Corporation • New Millennium Capital Corporation is planning to develop an iron ore mine in Quebec and Western Labrador, approximately 30 kilometres northwest of Schefferville, Quebec. • Ore will be transported via rail to Sept-Îles, Quebec, for shipment to customers.	Reasonably Foreseeable Project
Bloom Lake Railway Proponent: Consolidated Thompson Iron Mines Ltd. • Consolidated Thompson Iron Mines proposes to construct and operate a new 31.5 kilometre long single-track railway line to connect the company's new load-out facilities within Labrador with the existing railway line between Wabush Mines and the Quebec North Shore & Labrador Railway.	Reasonably Foreseeable Project

As discussed in Section 6.2, caribou observed in the Assessment Area are expected to be part of the George River Caribou Herd (Schmelzer and Otto 2003, Bergerud et al. 2008). The Assessment Area of 10,000 km^2 represents approximately 1 percent of the range of the George River Herd, and the physical disturbance associated with the Project would represent less than one percent of the Assessment Area. The other projects will collectively represent a larger proportion of the Assessment Area. Each other foreseeable project will be subject to the same scrutiny, regulatory environment and codes of best practice as LIM and therefore would reduce their respective effects as much as possible. These activities would be continuous, and persist over several generations. Regardless, and based on the extensive range of the George River Herd and the location of the Assessment Area at its periphery, it is expected that the development of the James and Redmond deposits within the context of other regional activities would result in a measurable change that would not cause management concern. These effects are considered reversible and not significant (Table 6.12).

Table 6.12 Summary of Residual Environmental Effects for Caribou: Cumulative Effects

Mitigation	
Both projects would be subject to applicable Federal and Provincial regulations	
Significance Determination	**George River Caribou Herd**
Geographic extent	Assessment Area
Frequency of occurrence	Continuous (throughout Project)
Duration of effect	Over several generations
Magnitude of effect	Measurable Change that does not cause management concern
Reversibility	Reversible
Significance	Not Significant
Confidence	Not Applicable
Likelihood of occurrence	Not Applicable
Follow-up and monitoring	
See section 7.3.3	
Note – As residual environmental effect is not significant, description of Confidence and Likelihood of Occurrence is Not Applicable	

6.3 Employment and Business

Employment and business was chosen as a VEC based on public concern that economic benefits accrue to local communities, Labrador and the Province. This includes benefits to the population and economy as a whole, and to such under-represented groups as the Innu and women. The effects on employment and business have been assessed on other recent projects and such an assessment is required under the Project EIS Guidelines.

6.3.1 Potential Project-VEC Interactions

Issues relating to employment and business and the Project include:

- The creation of employment for residents of the Province, including Labradorians, the Innu and women;
- Training requirements associated with Project employment, in support of the above employment objective;
- The creation of business for Newfoundland and Labrador companies, and especially those located in Labrador; and
- Inflationary effects on the costs of labour, goods and services.

6.3.2 Employment and Business Assessment

There will be direct and indirect employment and business impacts resulting from, first, the construction of the Project and, second, from its operation. These will include the employment of, and income to, those working directly on the Project, indirect employment and income impacts to workers providing goods and services to the Project, and induced impacts, which are generated when those working directly and indirectly on the Project spend their incomes in the economy. These Project and Project-related expenditures have the potential to have inflationary effects. The effects management for this

VEC, primarily through the Project Benefits Policy (Section 2.2) and related initiatives, is and has always been intended as part of the Project and hence in is an inherent part of this assessment. As such, there is no separate section on effects management.

As required by the *EIS Guidelines*, this section includes employment and business goals for both the construction and operating phases of the Project.

Construction Phase

Direct Impacts

There will be substantial short-term employment benefits during the construction phase of the Project. This will involve an average total of approximately 100 workers employed over the approximately one-year duration of construction. The direct construction phase employment is described, by NOC Code, in Table 3.4. Many of these positions can be filled from within Labrador, which will receive hiring preference under the LIM Benefits Policy (Section 2.2) and through implementation of the associated strategy (Appendix D). LIM will fill any positions that cannot be filled locally by using a commute system. This will see Provincial Airlines/Innu-Mikun Partnership flying construction workers to and from Goose Bay and possibly Wabush Airports. (Alternatively, Labrador West employees may commute to and from the site by road to Emeril Junction and train to Silver Yard.) All workers will report to work at Silver Yard.

The employment of the Labrador Innu and women will be promoted through the IBA with the Innu Nation of Labrador and Project Equity Plan respectively.

The IBA is a life-of-mine agreement that establishes the processes and sharing of benefits that will ensure an ongoing positive relationship between LIM and the Innu Nation. In return for their consent and support of the Project, the Innu Nation and their members will benefit through training, employment, business opportunities and financial participation in the Project.

The Project Equity Plan will: detail LIM's approach to employment equity; identify occupations in which women are under-represented: use this to establish appropriate initiatives and targets; and, describe a process for achieving these targets; monitor success in meeting them, and reviewing and revising equity initiatives. This plan will apply to LIM and its Project contractors.

LIM will continue to liaise with the College of the North Atlantic to investigate training local residents for these construction positions. However, it is recognized that the opportunities for training specifically for this Project will be very limited, given the small number of positions and short duration of employment.

Project construction will be completed by mid-2010. As such, it will be complete in advance of the construction labour requirements of such other proposed Labrador projects such as the Lower Churchill Hydroelectric Generation Project (peak employment 1,700, construction period 2010 to 2018) and Aurora uranium mine (peak employment 700, construction period 2011 to 2014), and it will therefore not compete with them for labour. Indeed, the Project will provide employment to some workers in Labrador West who are currently unemployed, as a result of the economic downturn. The Project will also provide these and other Labrador residents with an opportunity to further develop their skills and employment experience, thereby assisting in the development of the labour force for subsequent projects.

It is anticipated that a number of the Project-specific engineering, design and specialized Project management positions will be filled from outside the Province. Overall, though, LIM has established a

goal of having 75 percent of construction phase direct employment accruing to Newfoundland and Labrador, most of it in Labrador. Specific targets and initiatives with respect to women's employment will be specified in the Women's Employment Plan.

Indirect Impacts

The local share of supply and services contracts will be maximized through the LIM Benefits Policy (Section 2.2) and associated strategy. This policy will build on, and is consistent with, LIM's past performance in delivering local benefits. LIM has spent $4.5 million on goods and services from Newfoundland and Labrador companies since 2004.

For example, the following contracts have been awarded to Newfoundland and Labrador companies in the past:

- SNC-Innu is currently conducting an engineering study on the Project;
- Cartwright Drilling carried out an exploration drilling program in 2006;
- Jacques Whitford was retained to prepare this environmental assessment; and
- RSM Engineering carried out a bulk-sampling and crushing and screening program in 2008.

In addition, preliminary discussions have been conducted with other Newfoundland and Labrador-based companies and this work may be awarded at the appropriate phase of the Project. Examples include:

- Land Surveying: N.E Parrot Surveys Ltd, to execute the legal land surveys; and
- Provincial Airlines/Innu – Mikun Partnership to provide air transportation services.

As was noted above, under the terms of its IBA with LIM, the Innu Nation of Labrador and their members will benefit through Project business opportunities.

The construction of the mine will see the procurement of a wide range of goods and services, the majority of which are available in the Province. They include:

- Earthworks;
- site construction;
- buildings construction;
- plant construction;
- mine preliminary works and overburden stripping;
- fuel and refuelling services;
- welding and machining goods and services;
- land surveying;
- taxi and car rental;
- hotel accommodations;
- blasting;

- pipe-laying;
- road construction;
- electrical and mechanical contracting;
- miscellaneous tools and small equipment;
- heavy equipment rental (cranes, excavators, loaders); and
- independent environmental monitoring.

The rail-specific construction contracts to be let include the following that are expected to be awarded, as per the LIM Benefits Policy (Section 2.2), to Labrador or Newfoundland companies include:

- clear cutting; and
- rail bed reinstatement.

In addition, accommodations at Squaw Lake will house and provide catering, recreation and related facilities to up to 80 construction workers, management personnel and visiting specialists. These camps, owned by Labrador-based Adventure Labrador, Labrador Hunting Safari and Labrador Outdoors, will require additional catering, cleaning and maintenance workers. Furthermore, Project contracts will help sustain and support these camps and their traditional tourism role.

In some cases, Project materials and services are not available in Labrador or, indeed, the Province, and there is no reasonable expectation of this being changed as a result of the Project, or any foreseeable level of provincial demand. For example, the following materials and services will in all likelihood need to be brought to the Project site from outside the Province:

- Crusher and beneficiation plant unit supply;
- mine engineering consulting services;
- rails, rail ties and other track materials; and
- rail cars and power units.

Depending on the source and characteristics, these materials will be transported by road from or through Québec, or by sea to Sept-Iles and then to the site via the QNS&L and TRT. In the latter case, this will represent back-haul traffic and hence it will not interfere with normal iron ore traffic on the QNS&L and TRT.

Based on the Project parameters, and in particular the fact that portion of the capital costs are related to materials which are not available in the Province, LIM has established an initial benefits strategy goal of having at least 50 percent of the value of construction contracts being awarded to companies based in the Province.

Induced Impacts

The use of a commute system will deliver Project-related economic benefits to those parts of the Province in which workers and their families live. Similarly, expenditures by the employees of companies contracted to work of the Project will benefit the Province and the region and communities in which they live.

Operation Phase

The Project will also help build the capacity of, and support, the local labour market and businesses during operations. For example, the operating plan of the mine will generate a smaller level of longer-term (an estimated five years duration) seasonal employment benefits to Labrador, including personnel who will undertake minor and emergency railway rolling stock maintenance and repairs. In total, the mine will directly require 65 positions (Table 3.6), mostly for about seven months per year. These seasonal workers will be employed by a contractor.

The number of rolling stock maintenance personnel based in Labrador will be small, but may increase over time, as the stock ages and as and if the amount of such equipment grows as Project traffic increases or as new companies use it. LIM will be proactive in seeking to increase the amount and types of rolling stock maintenance occurring in Labrador, providing such activity can be justified on a commercial basis.

The majority of the mine operation workers will be hired from Labrador, given the nature of the occupations involved, the lead time available to train local people for them, and the LIM Benefits Policy. This policy (see Section 2.2), which will apply to LIM and Project contractors, will give employment preference to, first, qualified residents of Labrador, and then qualified residents of the Province as a whole.

As is the case for the construction phase, the employment of the Labrador Innu and women will be promoted through the IBA and Project Equity Plan respectively.

Overall, LIM has established an initial benefits strategy goal of having 65 percent of operation phase direct employment accruing to Newfoundland and Labrador, most of it in Labrador. Specific targets with respect to women's employment will be specified in the Women's Employment Plan.

LIM will continue to liaise with the College of the North Atlantic to investigate training local residents for these positions. However, it is recognized that there are few senior and experienced mine operation personnel in Labrador, and these positions may have to be filled from elsewhere.

While some workers will be hired from, and live in, Schefferville, most of the Project operations workers and their families will live in Labrador and contribute to its economy and community life. As during construction, these Labrador residents will commute between Silver Yard and Goose Bay, and possibly Wabush, Airports. (Alternatively, Labrador West employees may commute by road to Emeril Junction and train to Silver Yard.)

These operations positions will have modest spin-off employment effects. It is expected that, as with the construction phase, these workers will be housed in camps at Squaw Lake. These camps will require additional catering, cleaning and maintenance workers, and Project contracts will help sustain and support them and the traditional tourism role of the camps. Provincial Airlines Innu-Mikun Partnership will be contracted to provide commute transportation.

Mine operations will also require a range of goods and services, the majority of which are available locally. For example, a review of local capabilities indicates that the following will be available on a commercial basis from within Western Labrador:

- fuel and refuelling services;
- welding and machining goods and services;

- hotels and catering services;
- taxi, car rental and rail passenger and air transportation services;
- repair shops;
- hardware stores miscellaneous tools and small equipment;
- heavy equipment rental (e.g. cranes, excavators and loaders);
- local contracting services (e.g. construction, electrical and mechanical); and
- some other goods and services will be available from elsewhere in the Province. Based on this, LIM has established an initial benefits strategy goal of having 65 percent of the value of operations phase contracts being awarded to companies based in the Province.

Decommissioning

The amount of employment and business associated with decommissioning will depend upon the specific techniques employed, but will likely involve grading, material transportation, monitoring and other activities that Labradorians and Labrador companies are well qualified to undertake. These opportunities will only be clear closer to decommissioning.

Summary

The Project will make a significant contribution to the further economic development of the Province and, in particular, Labrador, by:

- providing local employment and incomes during construction and operations;
- providing local business during construction and employment;
- providing an important opportunity for participation by the Innu Nation of Labrador in the provision of services, businesses, employment and training;
- increasing the capacity and skills of local labour force and businesses, in advance of Lower Churchill and other projects; and
- facilitating further mining development by putting in place these new labour and business capabilities and new transportation infrastructure, thereby making existing and new Labrador projects more competitive globally.

No significant adverse effects are expected. The numbers of workers and scale of expenditures are not sufficient for there to be a danger of inflationary effects, especially given the current downturn in the economy, which is forecast to continue through the Project construction phase.

The residual environmental effects of the Project on Employment and Business are summarized in Table 6.13.

Table 6.13 Summary of Residual Environmental Effects for Employment and Business (All Phases)

Effects Management	
• LIM and its contractors will include a copy of the LIM Benefits Policy in all Project calls for expressions of interest, requests for proposals, and contracts • LIM will liaise with provincial, and especially Labrador, educational institutions and human resources agencies so that they are informed about employment requirements and plans • LIM will liaise with provincial, and especially Labrador, business groups and economic development agencies so that they are informed about goods and services requirements and plans • LIM will monitor the Project labour force to establish the percentage of positions held by residents of the Province • LIM will monitor the award of Project contracts to establish the percentage of the work, by value, awarded to companies based in the Province • LIM will, on an annual basis, compile the above monitoring data, assess them relative to Project benefits targets and, if necessary, review and revise its benefits approach, initiatives and targets • LIM will, make the above annual compilation of benefits data available to government departments and agencies, upon request • LIM will, implement the provisions of its Project Women's Employment Plan	
Significance Determination	
Geographic extent	Regional
Frequency of occurrence	Continuous
Duration of impact	Long-term
Magnitude of impact	Low
Permanence/reversibility	Reversible
Significance	**Not Significant**
Confidence	Not applicable
Likelihood of occurrence	Not applicable
Follow-up and monitoring	
• LIM will monitor the Project labour force to establish the percentage of positions held by residents of the Province; • LIM will monitor the award of Project contracts to establish the percentage of the work, by value, awarded to companies based in the Province; • LIM will, on an annual basis, compile the above monitoring data, assess them relative to Project benefits targets and, if necessary, review and revise its benefits approach, initiatives and targets; • Make the above annual compilation of benefits data available to government departments and agencies, upon request; and • LIM will implement the provisions of the Project Women's Employment Plan.	
Note – Confidence and Likelihood of Occurrence are Not Applicable when residual environmental effect is not significant	

6.3.3 Cumulative Environmental Effects

The assessment of the effects of the Project on employment and business is based on the baseline conditions (Section 4.3.3). Future projects in this area include the possible construction of the Elross Lake Iron Ore Mine and the Bloom Lake Railway.

As has been described above, the Project will employ approximately 100 workers for a construction period of one year, starting in May 2009. The Elross Lake Project could employ an estimated total of 150 people over a 15-month construction phase, starting in 2009 (New Millennium, 2008), and Bloom Lake Railway construction will involve an average total of 160 workers but is scheduled to be completed in September 2009 (Consolidated Thompson, 2008) and will not overlap with Elross Lake. It

is anticipated that a maximum of 250 construction workers will be required at any one time across these projects. Furthermore, the occupations required will vary across the three projects, and the schedules of them may permit workers in some occupations to work on more than one project.

While it is expected that all three operations will draw on the existing labour force resident in Labrador (there were 800 workers in construction occupations in Labrador at the time of the 2006 Census), any possible shortage can be addressed through employing workers living on the Island of Newfoundland, which had a total 2006 construction labour force of nearly 17,000 workers. It is noted that the current economic situation in Labrador West will facilitate hiring for that region.

The numbers employed in operations are smaller than construction for all three projects. It is has been indicated that during the operation of Phase 1 of Elross Lake, between 2010 and 2013, 150 people will be employed (New Millennium, 2008). The operation of the Bloom Lake Railway project is tentatively scheduled to begin in late-2009 and require only 12 full-time positions (Consolidated Thompson, 2008). In conjunction with the Project, this results in a total operations employment of only 200 jobs. This should make a valuable contribution to the economy while not resulting to labour shortages or wage inflation.

The cumulative business effects of the three projects will be important to the contracting companies involved, but not place any undue demands resulting in wage and price inflation, especially the recent economic downturn, which is forecast to last for some years. Given the duration of the operations phases, activity on these projects may also result in some expansion of business capabilities.

6.4 Communities

The communities most likely to be affected by the Project are the primary places of residence of the Project labour force: Labrador West, Upper Lake Melville and Schefferville. Labrador West is also the home of many contracting companies providing goods and services to the Project. LIM will have offices in Labrador West and Happy Valley-Goose Bay. In addition, the Goose Bay and Wabush Airports will be used in the provision of some labour and supplies.

6.4.1 Potential Project-VEC Interactions

As required by the EIS Guidelines, this assessment focuses on the effects on health services in Labrador. These are discussed in the context of the broad demographic and other effects of the Project.

6.4.2 Communities Assessment

Construction

The construction of the Project will have a negligible short-term direct effect on the communities of Labrador West and Upper Lake Melville. It will only employ approximately 100 workers for a year (Section 3.2.8), and some of these workers will already be residents of these communities when hired. As a result, it is very unlikely that any workers will move to them as a result of Project construction, and hence that there will be an effect on public or community health services, or other community social or physical infrastructure or services, as a result of Project-related population increase.

The commute system for construction workers will be designed to transport construction workers to and from their communities as efficiently as possible. As a result, there will be few occasions when commuting workers will spend more than a short period in Labrador West and Upper Lake Melville communities while en route to or from the workplace. There is a very small likelihood of negative interactions between workers and local residents that might place demands on policing or healthcare services and infrastructure.

Most workers will continue to receive general healthcare in their home communities. Any minor injuries or health problems will be addressed through the provision of first-aid at the worksite. If additional care is required, workers will utilize the health clinic in Schefferville, Quebec. If more specialized care is needed, workers will be transported to the Captain William Jackman Memorial Hospital in Labrador City.

However, the effects of the construction phase on local healthcare services and infrastructure will also be minor because the labour force will be small, the workers will mostly be in the prime of life, and accidents will be minimized through rigorous enforcement of LIM's occupational health and safety standards. As a result, no significant new Project-related demand on health services and infrastructure is anticipated.

Operation Phase

The Project will also help build the capacity of, and support, local labour market and businesses during operations. For example, the operating costs of the mine will provide a smaller level of longer-term (an estimated five years duration) seasonal employment benefits to Labrador, including personnel who will undertake minor and emergency railway rolling stock maintenance and repairs. In total, the mine will directly require 65 positions (Table 3.6), mostly for about seven months per year. These employees will be largely employed by contractors.

While there will be some multiplier effects of operations, these will have an even smaller incremental effect, especially as most of this employment will go to local residents working for supply and service companies, retail outlets, restaurants, etc. While it will make a minor long-term contribution to the economy of Western Labrador, it is very unlikely that the operations phase spin-off employment will need to be met through in-migration into the region, resulting in additional demand for community and public healthcare services and infrastructure.

As during the construction phase, the commute system for any non-locally resident workers will be designed to minimize the possibility of negative interactions between workers and local residents that might place demands on policing or healthcare services and infrastructure. Furthermore, most workers will continue to receive general healthcare in their home communities, minor injuries or health problems will be addressed through worksite first-aid, and if additional care is required, workers will utilize the health clinic in Shefferville, Quebec. Only when more specialized care is needed, workers will be transported to the Captain William Jackman Memorial Hospital in Labrador City, but the workers will again mostly be in the prime of life, and accidents will be minimized through rigorous enforcement of Labrador Iron Mines' occupational health and safety standards.

As a result, no significant new Project-related demand on health services and infrastructure is anticipated.

Decommissioning

The amount of employment associated with decommissioning will depend upon the specific techniques employed, but Labradorians will likely to be well qualified for this work. However, the scale of such employment will likely be smaller and of shorter duration than operations, and hence is not expected to result in significant new Project-related demand on health, or other community, social or physical, services and infrastructure.

The residual environmental effects of the Project on communities are summarized in Table 6.14.

Table 6.14 Summary of Residual Environmental Effects for Communities (All Phases)

Effect Management	
• Use a commute system and camp accommodations for most Project workers • Minimize time commuting workers spend en route in communities • Rigorous occupational health and safety provisions and implementation	
Significance Determination	
Geographic extent	Regional
Frequency of occurrence	Continuous
Duration of impact	Long-term
Magnitude of impact	Low
Permanence/reversibility	Reversible
Significance	**Not Significant**
Confidence	Not applicable
Likelihood of occurrence	Not applicable
Follow-up and monitoring	
The monitoring of demands on community services and infrastructure is the responsibility of the relevant government departments and agencies, as part of their normal planning processes. LIM will assist by liaising with them, as requested, and through the timely provision of information about Project activity and plans.	
Note – Confidence and Likelihood of Occurrence are Not Applicable when residual environmental effect is not significant	

Cumulative Environmental Effects

The assessment of the effects of the Project on communities is based on the baseline conditions (Section 4.3.4). Future projects in this area include the construction of the Elross Lake Iron Ore Mine and the Bloom Lake Railway. Given the preliminary scale of these projects and their assumed use of commute employment, it is not expected that they will have significant effects on healthcare or other community services or infrastructure in Labrador West or Upper Lake Melville.

6.4.3 Implications for Other Mining Projects, Railways and Mineral Exploration

LIM has been holding discussions with railroad and port operators for an extensive period. To date these have resulted in a number of confidential Memoranda of Understanding regarding the supply of such services.

During 2008 LIM reached agreement with the railroad operators TRTI and QNSLR, and with two port and stevedoring companies, regarding the transport, unloading and storage of its bulk sample products over the railroad lines and port facilities. During 2008 these tonnages were transported from the Silver Yard site to port. LIM expects that, subject to completing confidential commercial negotiations, these arrangements will be extended to cover the periods included by the Project production scenario.

LIM notes that each of the railroads over which its iron ore will be transported to port are covered by the application and provisions of the Canada Transportation Act 1996, and accordingly are required under the terms of that Act to provide a level of service.

LIM continues to be in discussion regarding ongoing port facilities under various Memoranda of Understanding, and expects to conclude successful and friendly negotiations with various port operators to provide a sufficient level of stevedoring service in the general Port of Sept-Îles area well before the commencement of commercial production. LIM also expects to extend these agreements to cover the expected life of this Project.

6.5 Accidental Events

6.5.1 Fish and Fish Habitat

Accidental events that could have consequences for fish and fish habitat include: sedimentation events due to slope failure, flooding; pollution from vehicular accidents, spills; and fire. Accidents leading to sedimentation events can vary in origin, area, intensity and duration, however the results are usually restricted to the site of the event and the downstream habitat. These events are usually localized in nature and reversible if the intensity is not extreme. Sometimes habitat can be rehabilitated if natural restoration is not evident.

Spills are also usually limited to a local area with various downstream effects within the same watershed. The effects of accidental introductions of pollutants into fish habitat will vary with the material and intensity (i.e., amount and duration). Fish kills may result from exposure to acutely lethal substances. Sub-lethal effects from less toxic materials may result in stress, lack of condition, impairment of growth or reproduction, or avoidance.

Forest fires can spread from watershed to watershed, moving with the prevailing wind. Fires can consume riparian vegetation, destabilize shore area soils, and lead to erosion and sedimentation events. Habitat can be degraded by the removal of riparian vegetative cover and associated food and nutrient input.

The adverse environmental effect would be reversible and localized and would be not significant.

6.5.2 Caribou

Accidental events and malfunctions for this Project could result in change in habitat and/or mortality for caribou. Provided that the effects management measures outlined in Section 6.2.5 are adhered to, the risk of an accidental event and the extent of its influence would be reduced to an unlikely event. The most probable of accidental events would be that of a forest fire related to Project activities or a hazardous material spill. Fire prevention and response measures will remain in place throughout the Project. The geographic extent of a forest fire could extend beyond the site (within the Assessment Area), but is not likely to occur. The effects could last for several generations (Foster 1985, review by Bergerud 2008), and of a magnitude that would cause management concern although overall for this population, large fires occur naturally and result in extensive changes in habitat and associated distribution. These effects are natural and would be reversible but would be considered as significant. There is a high degree of confidence that a large fire would result in a significant effect but the measures in place and design of the Project would infer this is an unlikely event.

A hazardous material spill would be confined to the site and would not be expected to interact in a meaningful manner (if at all) with caribou from the George River Herd. This event would be considered not likely to occur and would result in no measurable change to baseline conditions. The adverse environmental effect would be reversible and not significant.

6.5.3 Employment and Business

Any cessation of Project activity as a result of accidental effects and malfunctions will have a negative effect on Project employment and business. However, such cessations would be anticipated to be short-term and resulting adverse socio-economic effects would be not significant.

6.5.4 Communities

All Labrador communities are at such a distance from the Project site that they will not be directly affected by any accidental effects and malfunctions. However, any cessation of Project activity as a result of such effects and malfunctions will have a negative effect on Project employment and business, and these may have secondary effects on Labrador communities. The adverse effect would be not significant; conversely, there may be secondary community affects resulting from employment and business associated with dealing with the consequences of such effects and malfunctions.

6.6 Effects of the Environment on the Project

The EIS Guidelines specifically requires that the effects of the environment on the mine be assessed, considering in particular the vulnerability and potential risk to the mine from climatic elements (including wind, weather and global climate change). The following section evaluates the potential effects of extreme and other climate events on the mine in consideration of future climate change.

Climate change considerations for the Project are assessed following guidance issued by the Canadian Environmental Assessment Agency Guidelines (CEAA 2003). Considerations focus on the longer operating phase of the Project as opposed to the construction phase, and include analysis of climate parameters that could change over the period influencing Project operating conditions, and magnifying or buffering Project related environmental effects.

The range of effects on the Project due to the physical environment can range from minor facility improvement to catastrophic failure. The primary mitigation tool is the use of sound planning. All engineering design must be done to National Building Code Standards. These standards document the proper engineering design for site specific extreme physical environmental conditions and provide design criteria, which the federal government considers satisfactory to withstand potential physical environmental conditions. These codes consider physical environmental criteria such as wind, snow, wave and ice loading and drainage. In addition, the design life is taken into consideration so that materials are chosen with sufficient durability and corrosion resistance.

A significant effect of the environment on the Project has been defined as one that results in:

- A substantial delay in construction (e.g., more than one season);
- A long-term interruption in mining operations;
- Damage to infrastructure that compromises public safety; or
- Damage to infrastructure that would not be economically and technically feasible to repair.

The potential effects of the environment on the Project are assessed below.

6.6.1 Climate Change Predictions

General Circulation Models (GCM) are considered to be the most comprehensive models for predicting the effects of GHG emissions on the global climate. However, these models become less accurate when attempting to predict regional changes in climate. Climate projections for more specific locations require the development of models that will incorporate specific regional and local climate variables with broader-scale climate change scenarios from the GCM (Lines et al. 2005). Downscaling techniques have begun to emerge over the last decade to meet this requirement. Downscaled climate model predictions for Goose Bay, NL were used assess the potential changes in temperature and precipitation at the LIM sites.

Climate can be described in terms of average temperature and precipitation, as well as day-to-day and year-to-year variations and extremes that define weather. The baseline Climate (1971 – 2000) for this region is described in Section 4.1.1.

6.6.1.1 Temperature and Precipitation

Downscaled model results are available for Goose Bay, NL which is southeast of Schefferville. Results tend to differ between a Statistical Downscaling Model (SDSM) and Global Climate Model (GCM). Monthly, seasonal, and annual SDSM results were typically indicating higher temperature and precipitation changes than those of the Canadian coupled global climate model version 1 (CGCM1).

The overall increases in the annual average minimum temperatures projected for Goose Bay between 2020 and 2080 range from 1.3 C° to 4.1 C°, and from 1.7 C° to 5.0 C° for the SDSM and CGCM1 model results respectively. These results are consistent with projected changes to the annual average maximum temperature for the same time period at Goose Bay, expected to range from 1.8 C° to 4.7 C° and 1.6 C° to 3.8 C° for the SDSM and CGCM1 model results respectively (Lines *et al.* 2005) (Table 6.15)

Table 6.15 Projected Mean Annual Maximum and Minimum Temperature Increases, and Percent Precipitation Change for the 2020s, 2050s, and 2080s

	T max Change C º		T min Change C º		Precipitation Change (%)	
	SDSM	CGCM1	SDSM	CGCM1	SDSM	CGCM1
2020s	1.8	1.6	1.3	1.7	2	-3
2050s	2.3	2.1	2.2	2.9	3	3
2080s	4.7	3.8	4.1	5.0	5	9

Notes: SDSM and CGCM1 model results calculated using 1961-1990 baseline years. Source: Lines et al. 2005

The SDSM predictions for maximum temperatures for the 2050s at Goose Bay for summer, fall and winter increases are 2.2 C° to 4.3 C°, while for the spring, slight cooling is anticipated (-0.8 C°). By the 2080s, temperatures are projected to increase in all seasons, with greater warming in the summer, fall and winter (4.6 C° to 7.1 C°) than the spring (1.2 C°) (Lines *et al.* 2005). This average temperature change will be gradual over the period and will change precipitation types and patterns. The SDSM predictions for precipitation change for the 2050s are for spring, summer, and fall increases (1 percent to 8 percent), while for the winter, decreasing precipitation is anticipated (-6 percent). By the 2080s,

precipitation is projected to increase more in the fall and summer (9 percent to12 percent), and decrease in the spring and winter (-2 percent) (Lines *et al.* 2005).

The warmer fall and winter could cause later freeze up and earlier spring break up, wetter and heavier snow, more liquid precipitation occurring later into the fall, more freezing precipitation, and a longer growing season (and hence, vegetation growth). With little change in spring temperatures, differences in ice formation and breakup patterns will likely be slight. The decrease of precipitation (snow) in the winter months could increase the area and depth of the permafrost. However, since there is overall warming predicted for all seasons, it is likely that the permafrost area and depth will decrease overall.

6.6.1.2 Water Table and Lake Levels

Based on the predicted changes in temperature and precipitation, it is also expected that the water distribution and resources will be altered. Between now and the 2080s, the temperature is expected to increase during all seasons. This increase in temperature, particularly in the summer, is expected to increase evapotranspiration. By the 2080's overall precipitation is also predicted to increase. Water runoff available to lakes, streams, bogs, and groundwater is determined by the levels of precipitation and evapotranspiration. Since it is predicted that the evapotranspiration will increase and that the precipitation will also increase, it is possible that these two effects will counteract one another. However, if either of these effects dominates, water levels and soil moisture could be affected.

6.6.1.3 Wind Speed

By the 2050s, it is predicted that on an annual basis there will generally be a decrease in mean sea level pressure (MSLP) across Canada, with the exception of the east coast, west coast, and south-eastern regions where there are small increases predicted (Barrow et al 2004). These changes in MSLP will result in a higher pressure gradient across Canada and may result in increased annual mean wind speeds (Barrow et al 2004). With the exception of the coastal areas, most areas in Canada are predicted to have increased wind speed, particularly Northern regions (Barrow et al 2004). The greatest increase is predicted to reach 25 percent over north-eastern regions of the country (Barrow et al 2004). Thus, in the area of the LIM properties, wind speeds are predicted to increase substantively by 2050.

6.6.1.4 Extreme Weather

Severe weather incidents are generally projected to be more frequent and more intense over the next 100 years, a continuation of current global trends, and based on projections of additional energy and moisture in the atmosphere as it warms. Such events will typically result in more intense precipitation events and more rapid surface runoff. Extreme weather events have the potential to disrupt transportation, electricity transmission, communications, as well as damage equipment and buildings on the LIM property.

6.6.2 Project Sensitivity to Climate Change

The effect of projected climate change on the Project was assessed qualitatively following the CEAA guidelines (CEAA, 2003). This assessment was based on the analysis of predicted changes to present climate over the period of operation of the Project to predict whether or not there is a risk to the public or the environment.

The sensitivity of various phases of the Project to these predicted changes was ranked (see Table 6.16). These rankings reflect the effect of climate change on the Project in terms of productivity or additional environmental management required. A ranking of Nil or Low indicates that no or very small changes are expected with respect to productivity or environmental management. A ranking of Medium indicates some intervention may be necessary to mitigate against decreased productivity.

Table 6.16 Project Sensitivities to Direct and Indirect Climate Influences

Climate Parameter	Project Phase		
	Construction	Operation	Decommissioning
Mean temperature	Nil	Low	Nil
Extreme temperature	Nil	Low	Low
Mean rainfall	Nil	Low	Nil
Mean snowfall	Nil	Low	Nil
Extreme precipitation	Low	Low	Low
Extreme winds	Low	Nil	Low
Earthquakes	Nil	Nil	Nil
Lake Levels and Streamflows	Nil	Low	Low
Soil moisture and groundwater	Nil	Nil	Low
Evaporation rate	Low	Low	Nil
Permafrost extent/levels	Low	Low	Low
Extreme weather events	Low	Low	Low

Note: Sensitivities for extreme precipitation and extreme weather events during operation have been rated as low since it is assumed that the Project will be designed to reduce or eliminate the affects of these events.

Project sensitivity for the construction phase is ranked as nil to low because weather conditions are likely to affect transportation of materials and construction activities only modestly in the period between approval and completion of construction.

Project sensitivity for operations is low overall. An increase in mean air temperature should not have a significant effect on the Project. An increase in precipitation and runoff may have an effect on surface storage ponds, though a larger design that incorporates potential future precipitation events would keep this sensitivity low. If there is a considerable increase in precipitation, additional excavation and/or construction of runoff water containment and sedimentation control structures will be required. Currently the pond capacity is designed for the highest precipitation in the past 50 years. To reduce the likelihood of an adverse effect, pond capacities should be designed for the highest precipitation event projected for the operating period. This could be achieved by adding the predicted increase in precipitation to the present design and then adding an additional safety factor since it is predicted that there will be more intense storms in the future.

Changes in multiple parameters (e.g., increased evapotranspiration and increased precipitation) may have additive effects or may have the effect of cancelling out a negative effect. Project sensitivity is ranked as nil for all other parameters (e.g., extreme winds, which may increase in magnitude and frequency) since the Project will be constructed to meet extreme weather criteria.

Project sensitivity for decommissioning is ranked as low overall based on the assumption of remediating the site to non-industrial land use following the life of the facility. The nature and the success of revegetation activities at the site would depend on climate conditions at that time.

As a result of this analysis, it is recommended that all components of this Project (ponds, buildings, equipment, etc.) are designed to avoid any adverse affect to the public or the environment due to the predicted future climate. Safety design factors will be incorporated where appropriate. In particular, settling ponds should be designed with consideration for the predicted increase in extreme precipitation events and overall increase in precipitation.

6.6.3 Summary of Effects of the Environment on the Project

The Project will be designed and built to safely withstand current climatic conditions in accordance with building codes and standard good practice. All materials specified for this Project will be in compliance with applicable building codes for anticipated temperatures, winds and precipitation levels and as such will maintain the integrity and ductility to function as they were designed. All components of the mine will also be designed to support the structural loadings created by extreme snow and ice events. All erosion and sediment control measures for the mine will be designed to handle extreme participation and sudden snow melt. Weather forecasts will be monitored during mine construction and operations. If extreme weather conditions in any way compromise a safe operation, accident prevention measures will be taken, including the temporary suspension of operations, as required. Prior to and following extreme precipitation events, all erosion and sediment control structures will be inspected to ensure integrity. Permafrost has been considered in this assessment and is not predicted to affect mine operations

The above discussion of climate change has ensured that the assessment has also considered future climatic conditions and their potential effects on the Project. As a result of this analysis, it is recommended that all components of this Project (ponds, buildings, equipment, etc.) are designed to avoid any adverse affect to the public or the environment due to the predicted future climate. Safety design factors will be incorporated where appropriate. In particular, settling ponds should be designed with consideration for the predicted increase in extreme precipitation events and overall increase in precipitation.

The mitigative strategies described above, can adequately address potential effects of the environment on the Project such that there will not be:

- a substantial delay in construction (e.g., more than one season);
- a long-term interruption in mining operations;
- damage to infrastructure that compromises public safety; or
- damage to infrastructure that would not be economically and technically feasible to repair.

Therefore the effects of the environment on the Project are predicted to be not significant.

7.0 ENVIRONMENTAL PROTECTION

7.1 Mitigation

7.1.1 Blasting

Although blasting is not planned during the construction phase of the Project, minimal blasting for rock removal will be conducted during the operations phases of the Project. Ground vibration, air blast, and fly rock resulting from blasting operations can have an impact on the surrounding environment. Vibration and air blast overpressures can impact wildlife, cause slope failures, and create avalanches. Fly rock can damage vegetation.

Blasting can have physical and chemical effects on fish and fish habitat. Shock waves and vibrations from blasting can damage a fish's swim bladder and rupture internal organs, and may kill or damage fish eggs or alevins (DFO 1994). Blasting can cause the re-suspension of sediments (Munday et al. 1986), bank failure and resultant sedimentation, and habitat avoidance. Nitrogen-based explosives can affect aquatic life through direct toxicity of the compounds, reducing dissolved oxygen during nitrification and providing nutrients for aquatic plants. Nitrite is toxic to fish and can reduce the oxygen carrying capacity of blood. Ammonia can cause gill damage and nitrate promotes algal growth. Pommen (1983) provides detailed information on the potential chemical effects of blasting. Guidelines for blasting near waterbodies, including specifications for blasting materials, their use, time of year and additional precautions, are outlined by DFO (1994) and, where applicable, will be employed.

Blasting operations at the Project will be designed to control vibration and air blast, and to minimize/contain flyrock.

Ammonia compounds from blasting residue will be managed in a manner to isolate these materials from watercourses. In areas of blasting (i.e., James North and South Pits and Redmond Pit), water (precipitation and groundwater) will be collected in in-pit sumps and directed to a dedicated settling pond for treatment prior to being directed to the Silver Yard for use in the beneficiation process.

7.1.2 Reject Fines Wash Water Slurry

Reject fines washwater generated from crushing, washing, and separation processes will contain 21 percent by weight of suspended solids. No chemicals will be used in the beneficiation process. Reject fines wash water will be controlled within the beneficiation area and will be directed to the former historical Ruth Mine Pit, which will provide sufficient storage capacity for solids and retention time for settling of suspended solids prior to release to the environment.

All diversions and settling ponds will be designed and constructed with appropriate dimensions and controls to ensure that all discharges are retained and treated to achieve the required quality prior to release to the environment.

7.1.3 Stormwater Management

Stormwater will be collected and directed to a settling pond in the Silver Yard area. In the event of pipeline maintenance or rupture, reject fines wash water will be discharged to this settling pond as well.

7.1.4 Mine Dewatering

Water collected in the James Pit as a result of precipitation and groundwater inflow will be directed to in-pit sumps and pumped to a settling pond to be constructed near James Pit (Settling Pond Area SP1) prior to release to the environment.

7.1.5 Grey Water/Domestic Sewage Management

The primary concern with domestic sewage is the potential to increase nutrient loading, suspended sediment or the introduction of oil and grease or other contaminants into a watercourse. These introductions can lead to oxygen depletion, eutrophication of waterbodies, adverse sediment effects or water quality contamination.

Sewage effluent will be collected and treated on site using a sterilization system and management of grey water and sewage will comply with the Newfoundland and Labrador *Water and Sewage Control Regulations*.

7.1.6 Air Quality

7.1.6.1 Mitigation

The main sources of emissions during both the construction and operation phases at the site include the products of combustion (NO_x, CO, SO_2) and fugitive dust from the operation of equipment. Mitigation techniques for these main source types are examined in more detail in the following sub-sections.

Emissions from Combustion

The main sources of combustion-related emissions during both the construction and operation phases are related to the operation of diesel generators in the first one to two years of operation, fuel-oil boilers, and from on-site road traffic. Although the generators and boilers are required for daily operations at the site, emissions from both sources will be reduced through the use of emission control technologies. Combustion emissions from on-site vehicle traffic will also be mitigated through:

- an anti-idling policy to limit emissions from vehicles that are not in use; and,
- a policy regarding the proper maintenance of equipment and vehicles operating in work areas.

Emissions from Fugitive Dust

Fugitive dust emissions during construction can occur during land clearing, ground excavation, and from equipment traffic on site. Potential sources of fugitive dust during operation include ore loading/unloading, ore crushing, stockpile erosion and dust from conveyor systems around the site.

Generally, fugitive dust emissions are:

- proportional to the disturbed land area and the level of activity;
- limited to periods of the day and week when the activities take place; and,
- vary substantially from day to day with varying meteorological conditions.

Fugitive dust emissions occurring during construction are expected to be localized in extent, limited in duration, and smaller in magnitude than those occurring during operation.

During construction and operation, the following measures will be implemented at the site to mitigate fugitive dust emissions:

- wet suppression to control open dust sources; wetting or covering of transported borrow or fill; and,
- limiting the maximum speed of vehicles travelling along unpaved roadways.

7.2 Emergency Response/Contingency Plans

LIM has developed and implemented a Health and Safety (H&S) Program and a site-specific Environmental Protection Plan to meet corporate health, safety and environmental objectives and to ensure compliance with related Regulations for the Province of Newfoundland and Labrador. The site specific Environmental Protection Plan (EPP) will be submitted to, and approved by, the Minister of Environment and Conservation before any construction on the Project begins. A copy of LIM's Health and Safety Policy is presented in Section 2.2 (Environmental Management and Corporate Responsibility Policies).

The EPP will be a "stand alone" document with all relevant maps and diagrams. The target audience for the EPP will be the resident engineer, site foreman/supervisor, proponent compliance staff and the provincial environmental inspector(s) and, therefore, the EPP will concentrate on addressing such issues as construction/operation mitigation, permit application and approval planning, monitoring activities, contingency planning for accidental and unplanned events and contact lists. In addition, the EPP will contain a tabular breakdown of major construction and operational activities into sub-components, followed by permits required, field mitigation and contingency planning where appropriate. The objective of the EPP will be to present concise, comprehensive and easily accessed environmental protection information for field use by the target audience.

It is worth noting that the LIM H&S program was successfully implemented at the start of the 2008 geological drilling and field exploration program and the 2008 field program was successfully completed without any lost time incident.

7.2.1 Hazard Identification and Risk Assessment

A preliminary written assessment of all existing or potential health, safety or environmental hazards will be performed before work begins on any work site under LIM control. This assessment will further identify necessary management and / or worker action that may be required to eliminate or mitigate such identified hazards.

The objective in all cases is to ensure that all identified hazards have been eliminated or mitigated to the lowest practicable level. Any remaining hazards that cannot be eliminated or mitigated will be

subject to defined safe work procedures, combined with extensive worker training, in order to minimize the potential for worker injury or an environmental incident.

As part of the hazard assessment process the local natural environment will be recognized and assessed as it relates to possible wildlife encounters or possible exposure to extreme weather conditions that periodically occur in the Project area.

Examples of hazards and related emergencies that could potentially occur on a mining site in the Schefferville area are as follows:

- fire or explosion;
- equipment collision;
- collapse of mining slope;
- man overboard / water rescue;
- rescue, extrication or recovery of a worker;
- injury incident or medical emergency;
- wildlife encounter;
- extreme meteorological condition or natural disaster;
- an environmental spill;
- toxic or flammable gas leak;
- mining site evacuation; and
- public complaint regarding the environment or a health and safety concern.

7.2.2 Emergency Response Plan

Emergency Response Plans will be developed to deal with all potential incidents that could occur during Project construction, operation and closure activities. Once the Project has received regulatory approval, and the 2009 phase of Project construction has begun, LIM will monitor the programs and further update and refine its existing Emergency Response Plans to meet future Project requirements as well as implement corrective action, as required. Related plans will include:

- procedures for dealing with identified emergencies;
- available communication devices to summon emergency assistance;
- the on-site availability of fire-fighting equipment (such as fire extinguishers, water hydrants and protective gear);
- the on-site location of emergency facilities;
- resources and procedures for rescue and evacuation (including means of conveyance, such as an emergency vehicle or helicopter, as applicable);
- an emergency call list containing:
    - The names and contact numbers of emergency personnel
    - The names of all other persons to be informed in case of an emergency (e.g. owner, contractor and regulatory agencies)

- The names and contact numbers of any external “mutual aid” resources that can provide additional assistance in any case where such assistance is necessary
- The contact number and the location of any medical facilities capable of treating an injured worker

- an Environmental Response trailer fully equipped to address any environmental incident. (Including absorbent materials, fabrics and booms, etc);
- first aid services available at each individual work site, compliant with the First Aid Regulation for Newfoundland and Labrador;
- a list of available first aid supplies for each work site, compliant with First Aid Regulation for Newfoundland and Labrador and,
- a defined accident / incident investigation process for any incident that may occur at an LIM mining site.

7.2.3 Mutual Aid Agreement

Subject to permitting, LIM will proceed to develop mutual aid agreements with local communities and business located within reasonable response distance of the Project area.

It is a mining industry tradition that mutual aid is voluntarily extended in case of dire need and a request for assistance. To date, preliminary discussions have been conducted with the Town of Schefferville Administrator as well as representatives of the nurses at the Schefferville medical facilities to advise of proposed activities.

At this time the principal parties with whom further discussions will be conducted to provide mutual assistance include, but are not limited to, the following:

- municipality of Schefferville regarding fire fighting and ambulance service;
- Schefferville Health Clinics for medical aid;
- possible: New Millennium Capital Corporation for potential emergency response on any major mining or environmental incident;
- Wabush Iron (Wabush) for potential emergency response on any major mining incident or environmental incident;
- Iron Ore Company of Canada (Labrador City) for potential emergency response on any major mining incident or environmental incident; and
- Helicopter Services, for medical evacuation.

7.2.4 Contingency Plan

The Contingency Plan, which will be required under the Certificate of Approval for the operation of the mining and beneficiation process for the Project, must be submitted to the Department of Environment and Conservation, Pollution Prevention Division.

The purpose of the Contingency Plan is to outline information and procedures regarding emergency preparedness and response related to the storage and use of fuel, propane, and hazardous spills at the site. The Contingency Plan will also satisfy requirements under the *Canadian Environmental Protection*

Act (1999) regarding environmental emergency plans. The plan will define the roles of individuals and departments having particular responsibilities under the plan, and identify an action plan for spill response in any part of the operation.

A copy of the plan will be provided to representatives of the Schefferville Fire Department them. This will ensure cooperation and understanding of responsibilities and emergency response measures to be followed.

7.3 Environmental Monitoring and Follow-Up Programs

LIM will develop details of monitoring and follow-up programs when more information (i.e., conditions of release) becomes available. Objectives, methods, duration, and frequency of the programs will be provided to the Minister of Environment and Conservation as the programs are developed.

7.3.1 Air Quality

If required, an air quality monitoring program will be instituted at the site to determine changes in ambient air quality. This monitoring program would focus on measuring ambient dust level concentrations around the processing area and along the hauling routes between the ore deposits and beneficiation area. Further consultation with the NLDEC is required to discuss and confirm the detailed requirements of a proposed ambient air quality monitoring program.

A monitoring program designed as per the requirements defined under the "National Air Pollution Surveillance Network: Quality Assurance and Quality Control Guidelines" (NAPS) and focusing mainly on particulate emissions, could involve the following:

- measurement of ambient dust concentrations will be made using portable, battery-powered dust monitors. The monitors will be installed at suitable locations near each deposit and the beneficiation area (three stations in total). These samplers will run over a 24-hour period every six days, and the samples will be analyzed at a certified laboratory, similar to that required by the federal NAPS monitoring program; and
- dustfall (mass per unit time per unit area) will be measured using a network of dustfall jars along the roadway connecting the Redmond and James sites to the beneficiation area. Total dustfall will be determined by laboratory analysis of the jar liners. Dustfall samples will be collected on a monthly basis, for a three month period during the summer months, when production levels would be at their greatest and when meteorological conditions would allow for the highest potential emissions of particulate matter.

7.3.2 Water Quality and Environmental Effects Monitoring

Provincial regulations (*Environmental Control, Water and Sewer Regulations*) and permits (Certificate of Approval) may require effluent quality monitoring and toxicity testing on a regular basis. Effluent and receiving water quality monitoring and reporting may also be required under the federal *Metal Mines Effluent Regulations (MMER)*.

7.3.3 Caribou

Effects of mining activities on caribou is “fragmentary” (Wier *et al*. 2007) and it is therefore important to understand the distribution of caribou within and around the Project, and to understand the usage of these areas - whether as a travel corridor, or as an overwintering foraging area.

In June 2009, the Project will conduct a strip-transect aerial survey of the 10,000 km^2 Assessment Area. The objective will be to determine if caribou are present in this area during the calving period. The helicopter will fly transects spaced at 4 km intervals (Figure 4.15). If caribou are encountered, Wildlife Division personnel with assistance from LIM contractors will deploy up to 10 telemetry collars at this time. The collared caribou will provide information on the distribution, abundance, and herd affiliation of these animals.

The aerial survey pattern will be repeated in the fall/rut and winter seasons to provide a complete year perspective. The purpose of these surveys will be to monitor the presence of caribou that potentially inhabit this area and/or use the Assessment Area in their seasonal movements.

Throughout the life of the Project, LIM proposes to maintain liaison with Provincial Wildlife Division (and other) officials regarding the movements of the George River Herd (regardless of whether collars are deployed during the June 2009 survey). Through satellite collar and other monitoring conducted by others, LIM will implement an advisory to mine management staff should this herd enter the Assessment Area. Their movements would then be monitored more closely such that if animals approach with 3 km of blasting activities for example, operations would be discontinued until caribou have moved away. Such movements, observations and actions implemented by LIM would be recorded.

7.3.4 Employment and Business

LIM will monitor Project employment and expenditures, including the proportions of work going to Labrador and the Innu of Labrador. This information will be compiled on an annual basis and made available to government upon request.

Provisions respecting the employment of women will be specified in the Project Equity Plan.

7.3.5 Communities

The monitoring of demands on community services and infrastructure is the responsibility of the relevant government departments and agencies, as part of their normal planning processes. LIM will assist by liaising with them, as requested, and through the timely provision of information about Project activity and plans.

7.4 Rehabilitation

Closure rehabilitation, carried out once mining operations have ceased, includes all activities required to fully restore or reclaim the property as close as reasonably possible to its former condition or to an approved alternate condition. This would include demolition and removal of site infrastructure, revegetation and all other activities required to achieve the requirements and goals detailed in the Rehabilitation and Closure Plan.

The primary objective of the rehabilitation and closure planning and implementation is to return the site to pre-mining land contours and drainage patterns, matching the adjacent lands as closely as practical while maintaining long term physical and chemical stability. LIM's approach to rehabilitation at the proposed Silver Yard, James North, James South, and Redmond deposits will be to employ advanced progressive and closure rehabilitation techniques through integrated development, operational, and closure technology and design.

All aspects of mine development including mine design, infrastructure location and design, and operations planning have and will be conducted with full consideration of available progressive rehabilitation opportunities and closure rehabilitation requirements.

7.4.1 Beneficiation Infrastructure

All buildings and surface infrastructure will be dismantled and removed/disposed. All surface buildings and infrastructure to be demolished or removed will be cleaned of process materials and potentially hazardous material.

7.4.2 Salvage

Material and equipment with salvage value will be removed and sold. This expected salvage value will not be used to reduce the decommissioning cost estimate. Equipment and demolition debris with no marketable value will be disposed of in a manner consistent with relevant legislation and guidelines.

7.4.3 Roads, Pipelines and Power Distribution Lines

Roads and culverts will remain intact for post-decommissioning and emergency situations. Water and reject fines wash water pipelines will be emptied and removed from site. Any pipelines deemed necessary to be left in place will be cleaned, and capped. The power distribution lines will be removed.

7.4.4 Stormwater Management Settling Pond and Diversion Ditches

The sediment contained within the settling pond will be left in place unless removal is required to re-establish drainage. The remaining material will be graded and vegetated to reduce erosion and sedimentation.

Diversion ditches will be engineered to permit the re-establishment of natural drainage. On-going assessment of vegetation growth and the general health of the established vegetation will determine if any rehabilitation methods need to be pursued.

7.4.5 Overburden and Waste Rock Stockpiles

The peat and organics stockpile will be active over the life of the Project for use in progressive site reclamation and in the final closure phase. Overburden and waste rock (non-ARD generating) will be used in reclamation throughout the site for regrading or fill where required. Stabilization of remaining waste rock areas by grading and contouring to a stable slope angle to reduce erosion and sedimentation will be performed. The storage pad will be removed and reclaimed through regrading that will promote long term stability. Revegetation will be established on portions of the disposal facilities through a program of top dressing and seeding or transplanting as necessary to encourage the

growth of indigenous plant species. Excess non-mineralized mine rock at surface stockpiles will remain on the surface at closure.

7.4.6 Open Pits

Open pits will be decommissioned through a sequence of events designed for their long-term stability. Following the termination of open pit operations, waste rock may be deposited into the pit. Flooding of the pit will be allowed to occur naturally from groundwater inflows, snowmelt and rainfall within the pit catchment area. As per engineering specifications, the pit walls will be excavated to a stable slope angle. Pit water will be monitored on a regular basis as flooding proceeds, and, if required, treated prior to discharge.

7.4.7 Fuel and Hazardous Materials Storage Facilities

All fuel and chemical storage tanks and containers will be emptied and removed from the site. Connecting pipelines will be drained, cleaned and removed or capped as required. Any areas of major hydrocarbon or chemical contamination will be remediated through excavation and removal of the soil for off-site disposal in accordance to applicable regulations. Contaminated areas will be graded and contoured to reduce erosion and sedimentation from surface runoff. The areas will be stabilized to allow for revegetation.

7.4.8 Borrow Pits

Overburden that was removed during development of the borrow pits will be used in pit rehabilitation and slope regrading to promote site revegetation.

7.4.9 Explosives Storage

When decommissioned, all explosives in the storage facility will be removed, as well as all equipment that will be emptied, cleaned and removed. Other inert construction debris or materials will be disposed underground with the waste rock. Reclamation methods for the explosives storage facility is similar to that of any plant site building where surficial disturbances have occurred.

7.4.10 Revegetation

In general, site drainage patterns will be re-established, as near as practical, to natural, pre-development conditions.

Grading and/or scarification of disturbed areas to promote natural revegetation will take place. Where natural revegetation is not sufficiently rapid to control erosion and sedimentation, placement and grading of overburden for revegetation in areas may be necessary.

7.4.11 Monitoring

A post-closure monitoring program will continue from the operational monitoring program incorporating appropriate changes to the program. The post-closure monitoring program will continue for a minimum of two years after final closure activities are completed or until LIM and the appropriate regulatory

bodies are satisfied that all physical and chemical characteristics are stable. When the site is considered physically and chemically stable, the land will be relinquished to the Crown.

7.5 Environmental Protection Plan

Environmental protection procedures and measures will be implemented for all stages of the Project. The environmental protection measures summarized below will provide the basis for environmental planning and design of the various physical aspects and environmental characteristics of the Project. Detailed environmental protection procedures will be described in the Environmental Protection Plan (EPP) which will be developed prior to commencement of construction for the Project. The following measures will be considered:

- erosion protection measures will be applied for all exposed soil during site earthworks related to site development and construction, quarry and open pit excavation, and rehabilitation and closure activities. Additional measures such as ditch blocks, settling ponds and filter fabrics will be applied in problematic conditions, where high total suspended solids (TSS), steep gradients or high volumes of run-off are expected;
- vegetation buffers will be maintained around natural water bodies where alterations or crossings are not required. Maintaining vegetated buffer zones will aid in managing suspended solids in watercourses and reduce erosion and sedimentation;
- open Pit design (wall angles and benching) will incorporate erosion control measures;
- access road and rail bed design and construction will focus on protection of the aquatic environment by incorporating buffer zones, drainage and erosion control features and very conservative culvert design criteria. Culverts crossings will be designed and installed with consideration for road and stream gradient, ice conditions, bank stability and, where warranted, protection of fish habitat;
- road maintenance activities, such as grading and ice control (sand/gravel application), may cause sediment to be introduced into watercourses. Reasonable care in the application of sand and controlling erosion from grading will reduce this risk substantially;
- wildlife encounters may impose risk to both wildlife and Project personnel. There will be no fishing, hunting, or trapping by personnel at the Project site. Additional measures will be in place to reduce attraction of wildlife such as black bears to the site (e.g. proper storage and disposal of waste);
- hydrocarbon (fuels) and hazardous materials required during construction and operation will be stored pursuant to all applicable regulations. Fuel tanks will be located within an impervious berm, founded on compacted sand and will include an impermeable membrane that covers the entire area to prevent seepage of petroleum-based products. Hazardous materials will be stored in appropriate locations/facilities with proper containment and ventilation as required for each product;
- grey water and sewage will be managed in accordance with all applicable regulations. Sewage from the Silver Yard facilities will be treated using biological oxidation technology and the resulting grey water will be discharged with the reject fines wash water;
- mine, process and stormwater will be controlled, collected, and treated as follows:
    - reject fines wash water will be pumped via pipeline to Ruth Pit where sufficient retention time is available to allow settlement of solids prior to discharge to the environment (there is no chemistry anticipated);

  - mine dewatering water (precipitation, groundwater) will be pumped to the surface and retained in constructed settling ponds prior to release to the environment;
  - stormwater from the Silver Yard area will be collected and directed to a stormwater management pond located adjacent to the facility for treatment prior to release to the environment. This pond will also serve as the emergency discharge point for reject fines wash water; and
  - for all aspects of the development and operation, measures will be taken to divert water (stormwater runoff, etc.) away from developed areas.

- solid waste produced by site personnel and operations will be collected, hauled, and placed in a landfill facility in Schefferville, in accordance with applicable regulations. Bear-resistant containers will be used on site to prevent environmental or health hazards or conflict with wildlife. A Waste Management Plan will be developed and implemented for the Project to address all aspects of solid waste handling and disposal (except for mine and process waste materials – rock and washwater);
- dust from construction activities will be controlled by using water if required;
- environmental concerns that may arise from the use of mobile or remote pumps and generators will be addressed through the use of drip pans, proper storage of fuel, and routine inspection of equipment;
- noise associated with blasting and heavy equipment will be addressed by adherence to all permits, and approvals; and,
- the location and storage of explosive magazines will abide by the appropriate regulations.

These general environmental protection methods, which have been applied to many resource development and construction projects, will be applied to the specific design and construction criteria to develop a fully integrated EPP for this Project prior to development. The table of contents for the EPP is provided as an outline of how the plan will be structured (Table 7.1)

Table 7.1 Environmental Protection Plan Table of Contents

8.0 SUMMARY AND CONCLUSION

The following sections provide a summary of proposed mitigation measures, the anticipated residual environmental effects of the Project, and environmental monitoring commitments.

8.1 Mitigation

Based on the Project-VEC interactions and issues and concerns identified, and existing knowledge regarding these interactions and issues, mitigation measures to reduce or eliminate the potential adverse effects of the Project were identified. Mitigation included the incorporation of environmental considerations into Project design and planning, the implementation of LIM's EMS, and mitigation measures specific to particular VECs.

Where possible, a proactive approach to mitigating the potential environmental effects of the Project has been taken by incorporating environmental considerations directly into Project design and planning. Specific planning initiatives include:

- EPPs;
- Emergency Response and Contingency Plans;
- Occupational Health and Safety Plans;
- Reclamation Plan;
- Education and Orientation Plan;
- Mutual Aid Agreement; and
- Monitoring and Follow-up Plans

A mine decommissioning plan will be developed for the Project site upon mine closure. Progressive reclamation in work areas will occur throughout the life of the Project. The site will be rehabilitated to a safe and environmentally stable condition. LIM is also committed to complying with all relevant environmental legislation and regulations, and the conditions of required permits and approvals. Where required, other measures have been identified in relation to specific VECs. Mitigative measures which are applicable to each of the VECs under consideration are summarized in Table 8.1.

Table 8.1 Mitigative Measures Applicable to Each VEC

VEC	Mitigation/Effects Management Measures
Fish and Fish Habitat	• Erosion and sediment/erosion control (e.g., ditch dams, settling ponds, filter fabric) • Collection and treatment of contaminated water and site drainage • Clean water drainage will be diverted away from active work areas to reduce water treatment requirements • Design and implementation of fuel and other hazardous materials spill/contingency plans and emergency response in the event of an accident • Fishing by Project personnel while at site will be strictly prohibited; • Construction activities around watercourses will not occur during sensitive periods for fish • Maintenance of buffers along watercourses • Use of covered trucks and conveyors
Caribou	• Monitoring movements by the George River Herd, advisory to personnel when herd within Assessment Area; • Reporting observations to Provincial Wildlife Division; • Cessation of blasting when caribou are within 3 km;
Communities	• Use a commute system and camp accommodations for most Project workers • Minimize time commuting workers spend en route in communities • Rigorous occupational health and safety provisions and implementation
Employment and Business	• LIM and its contractors will include a copy of the LIM Benefits Policy in all Project calls for expressions of interest, requests for proposals, and contracts • LIM will liaise with provincial, and especially Labrador, educational institutions and human resources agencies so that they are informed about employment requirements and plans • LIM will liaise with provincial, and especially Labrador, business groups and economic development agencies so that they are informed about goods and services requirements and plans • LIM will monitor the Project labour force to establish the percentage of positions held by residents of the Province • LIM will monitor the award of Project contracts to establish the percentage of the work, by value, awarded to companies based in the Province • LIM will, on an annual basis, compile the above monitoring data, assess them relative to Project benefits targets and, if necessary, review and revise its benefits approach, initiatives and targets • Make the above annual compilation of benefits data available to government departments and agencies, upon request • Implement the provisions of LIM's Project Women's Employment Plan

8.2 Residual Environmental Effects

Residual environmental effects predictions were made taking into consideration the identified mitigation measures. Predicted adverse environmental effects were evaluated as significant or not significant based on a set of significance definitions developed for each VEC. The residual effects of each Project phase on each of the VECs under consideration are summarized in Table 8.2 and discussed below.

Table 8.2 Summary of Residual Environmental Effects

VEC	Construction	Operation	Decommissioning	Accidental Events
Fish and Fish Habitat	Not Significant	Not Significant	Not Significant	Not Significant
Caribou	Not Significant	Not Significant	Not Significant	Not Significant
Employment and Business	Not Significant	Not Significant	Not Significant	Not Significant
Communities	Not Significant	Not Significant	Not Significant	Not Significant

The residual adverse environmental effects of the Project's construction, operation and decommissioning phases and those resulting from accidental events on Fish and Fish Habitat and Caribou are evaluated as not significant. The residual environmental effects of the Project's construction, operation and decommissioning phases on Employment and Business, and Communities will be positive. The residual adverse environmental effects on Employment and Business, and on Communities resulting from Project construction, operation, decommissioning, or accidental events is not significant. The Project is therefore not likely to result in significant adverse environmental effects on the environment.

The environmental assessment also considers the likely cumulative environmental effects of the Project in combination with other projects and activities in the area. The Project will not occur in a pristine environment; the natural and human environments in the area have been affected by past mining activities. These existing effects have been considered as part of the baseline environment, and the assessment and evaluation of the cumulative environmental effects of the Project in combination with other projects and activities considers the nature and degree of change from these existing environmental conditions. The cumulative environmental effects of the Project in combination with other projects and activities in the area will be not significant.

8.3 Follow-up and Monitoring

Environmental monitoring (or follow-up) programs ensure that any unforeseen environmental problems can be identified and addressed in an effective and timely manner. Anticipated monitoring includes the following:

- water quality will be monitored in the receiving environment;
- toxicity testing may be required on discharges;
- environmental effects monitoring (water, fish, and benthic invertebrates) may be required to determine effects of the discharges;
- observations of caribou will continue to be reported to the Provincial Wildlife Division during the Project;
- LIM will develop and implement an Avifauna EMP to address the potential disturbance to nesting avifauna;
- progressive site reclamation measures, including the use of native plant species to enhance site revegetation, will be monitored throughout the Project;
- LIM will monitor the Project labour force to establish the percentage of positions held by residents of the Province;

- LIM will monitor the award of Project contracts to establish the percentage of the work, by value, awarded to companies based in the Province;
- LIM will, on an annual basis, compile the above monitoring data, assess them relative to Project benefits targets and, if necessary, review and revise its benefits approach, initiatives and targets;
- Make the above annual compilation of benefits data available to government departments and agencies, upon request; and
- LIM will implement the provisions of the Project Women's Employment Plan.

8.4 Conclusion

Based on the environmental effects assessment taking into consideration the mitigation and effects management measures, overall Project construction, operation and decommissioning are not likely to result in significant adverse environmental effects on any of the VECs identified for the environmental assessment. The potential residual effects of accidental events will be not significant, and unlikely to occur. No significant adverse cumulative effects have been identified for the Project.

The Project will, however, result in considerable socio-economic benefits. It will create considerable direct and indirect employment and business opportunities, and contribute substantially to the economy of the local area, as well as that of the Province of Newfoundland and Labrador as a whole by providing local employment and incomes as well as local business during construction and operation.

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