2.7.1 Port Operations

A typical year of operations at the port will see 178 million litres of fuel delivered in six to eight voyages (round trips) through the Inlet. The time required to unload each vessel will be about 48 hours. Marine barges will load 22 million litres of fuel and 560 tonnes of general cargo for delivery to Kitikmeot communities in 3 barge movements.

As soon as marine ice conditions permit, expected to be mid-July to early August, the vessels will begin to arrive at the port in Bathurst Inlet. The shipping season is expected to last 110 days per year and six to eight voyages per shipping season are planned to deliver fuel and supplies before the end of October. In-bound freight will also include other bulk goods such as lubricants, cement, reagents, and explosives for the various mining operations served by the Project. The Camp at the Port will have accommodations for 150; 31 employees will provide the port's work force to unload fuel tankers, load the trailers hauling other bulk goods to the sites served by the Project, and maintain and manage the port and road. The remaining camp capacity will be required for the contract drivers for the trucks hauling between the port and mine sites served by the Project. Port maintenance will involve site management services such as water, sewage, garbage, and roadwork including snow removal in winter and dust suppression in summer. Basic truck and trailer maintenance services will be provided by a local team of mechanics and service personnel.

2.7.2 Road Operations

Road operations will consist of two separate activities, road maintenance by Project personnel and hauling by trucks and drivers contracted directly by the mining company requiring their services. Road maintenance crews based at the port will maintain the road to Contwoyto Lake. The crew based at the Contwoyto camp will service the southerly portion of the Contwoyto Lake ice road crossing and supplement the road maintenance towards Bathurst Inlet.

The road will operate during the 100-day winter ice road season from mid-January to late April. All trucks and drivers for fuel and cargo will be supplied by contract truckers. The Project will control and monitor traffic via radio communications and GPS tracking. Load and speed restrictions will be regulated by Project "highway patrols". Loads will be split at Contwoyto Lake for travel on the winter road.

Road operations will deliver fuel and other bulk supplies from storage at the port to Lupin, Jericho, Ekati™ and Diavik. Haulage will be by B-trains (90 tonnes) traveling up to 60 km/hr. Hauling on the Contwoyto Lake ice road will be restricted to single trailers traveling at a maximum speed of 40 km/hr. The Contwoyto Lake parking area will be a temporary parking location for trailers. All road haul operations will be winter only. Up to 45 tanker units will be required to disperse the 150 million litres of diesel to the participating mines. It is expected that the majority of the tanker fleet will be active seasonally, arriving from Yellowknife when the Lupin winter road opens and return at the end of its operating season. It is expected that fuel tanker units will operate 24 hours per day during the winter ice road season until all of the fuel and supplies are delivered. Drivers off shift will use accommodations in the main camp at the port.

Priority will be given to Inuit businesses to become involved in the trucking, this will include Inuit owner/operators.

Road maintenance will consist of snow removal where required, and sanding icy portions. Sand and crushed rock for road maintenance will be taken from borrow pits adjacent to the road alignment. Please see Figure 4

for borrow site locations. Camp size at the Contwoyto Lake camp site is expected to be 20 persons for road maintenance and emergency services.

There will be some road maintenance in summer, including bridge and culvert maintenance. The sand and gravel for winter sanding operations will be stockpiled at strategic points during the summer.

2.7.3 Contwoyto Lake Winter Ice Road Operations

The ice road will be built by crews and equipment based both at Contwoyto and Lupin. The main route running the length of Contwoyto Lake is well established; the spur to the Contwoyto road terminal will be similar. Initial snow clearing over the 30 m wide ice road is expected to begin in mid-December with the minimum ice thickness of 1.5 m for light loads being achieved by late December. Full loads are not expected to cross Contwoyto Lake until mid-January. Load and speed restrictions will be regulated by Project "highway patrols". Load and speed restrictions on the ice road of Contwoyto Lake will require that only 45 tonne single trailer loads be hauled at speeds not exceeding 40 km/hr.

2.7.4 Operations Labour Force Requirements

The work force required to operate the port and road is shown in Table 5.

Table 5: Bathurst Inlet Port and Road operations work force* requirements

Function	Quantity		Location
	Summer	Winter	
Project General manager	1	1	Cambridge Bay
Controller	1 (part time)	1	Cambridge Bay
Purchasing agent	1	0	Cambridge Bay
Accountant	1	0	Cambridge Bay
Secretary/clerk	1	1	Cambridge Bay
Personnel/Safety	1	0	Cambridge Bay
Site manager	1	1	Port
Equipment operators	2	2	Port
Labourers	2	2	Port
Catering	3	3	Port
Security/Emergency measures/coms	2	1	Port
Road maintenance operators	0	3	Port
Drivers	0	8	Port
Labourers	0	1	Port
Port maintenance mechanic	1	1	Port
Port serviceman	0	1	Port
Electrician	1	1	Port
Instrument tech.	0	0	Port
Haul truck mechanic	0	3	Port
Haul truck serviceman	0	1	Port
Total	**17**	**31**	

* work force on site on a daily basis

The project operations work force in the field will have a "fly in/out" work rotation of 21 days on and 7 days off. The total annual payroll for the operations workforce is estimated to be $1.5 million (2002 dollars). An

additional $ 9 million will be paid for contract services of drivers for contracted trucks hauling bulk supplies and fuel for a total estimated annual operating payroll of $10.5 million.

2.8 PROJECT SCHEDULE: DECOMMISSIONING

2.8.1 Quarries

Quarries and pits will be developed at locations that allow drainage and so should remain dry. Quarries that are not required for maintaining the road during operations will be contoured and abandoned on completion of road construction. At no time during the construction or operations of the Project will active erosion of any terrain on or adjacent to the port and road and associated lands be allowed to proceed unchecked of alter drainage patterns in adjacent lands.

2.8.2 Port Sites

It is expected that the project will be in use for many generations in the future, nevertheless, the Project proponents acknowledge that non-renewable resources are finite and that some day the road and associated facilities may no longer be required. Closure and abandonment will include removal of all imported materials and structures, treating all contaminated soils, contouring all surfaces to reduce the possibility of erosion, and to enhance the natural vegetation of all terrestrial surfaces disturbed or altered by the Project.

2.8.3 Road

It is expected that the project will be in use for many generations in the future, nevertheless, the Project proponents acknowledge that non-renewable resources are finite and that some day the road and associated facilities may no longer be required. Closure and abandonment will include removal of all imported materials and structures, treating all contaminated soils, contouring all surfaces to reduce the possibility of erosion, and to enhance the natural vegetation of all terrestrial surfaces disturbed or altered by the Project.

2.9 ENVIRONMENTAL PROTECTION AND CONTINGENCY PLANS

The major components of the Project from construction, through operations, and into decommissioning will have direct interactions with the environment. The effects of construction on the tundra terrain will be observable for many years. Under normal operating conditions, there will be no further long-term environmental effects. There is, however, always the chance for accident and human error, which may pose risk of negative environmental effect to the Project sites and adjacent lands and waters. Table 6 provides an overview of the environmental management system (EMS) that will be developed by the Project in preparation for obtaining Project approvals. The EMS will implement the overall Bathurst Inlet Road and Port Project Environment Policy, which is provided Appendix 1.

Table 6 Project/environment interactions and related features of the Bathurst Port and Road Project Environmental Management System

Project Activity	Interaction	Risk	Project EMS Response
marine shipping	marine passage	loss of cargo, i.e. fuel, lubricants, explosives	-compliance with AWPPA.*
camp operations	-waste water discharge -garbage disposal	-contamination and erosion; -attract scavengers	-water treatment and controlled release; -incinerate all non-effluent waste and bury the ashes; -Project operations EMS.
unloading ship cargo	coastal habitats	fuel spill, cargo spill	-port site marine spill contingency and response plan.
pit/quarry development	terrain disturbance	erosion and slumping	-avoid ice rich sites; -protect ground thermal regime ; -contour final grades and surfaces; -construction operations EMS.
port site development	-terrain disturbance/ shoreline disturbance	erosion and slumping/ alter fish habitat	-avoid ice rich sites; -protect ground thermal regime ; -contour final grades and surfaces; -alter minimal area of coastal habitat; -construction operations EMS.
road construction	terrain disturbance water crossings acid rock drainage	erosion and slumping alter fish habitat change water quality	-avoid ice rich sites; -protect ground thermal regime; -contour final grades and surfaces; -construction operations EMS; -protect flow regime in water crossing design and construction. -construction operations EMS; -avoid high sulphide content rock for road construction; -blend low sulphide content rock with neutralizing rock.
port operations	terrestrial/aquatic environments	-spills	-spill contingency and response plan.
haul road operations	-road traffic	-dust -spills of fuel, cargo, -wildlife road kills	-dust suppression; -spill contingency and response plans; -spill equipment stationed along road route and on all trucks. -wildlife has right-of-way instructions to all drivers; -Project operations EMS.
loading barge cargo	coastal habitats	cargo spill	-port site marine concentrate spill contingency and response plan.

* AWPPA = Arctic Waters Pollution Prevention Act (Canada).

A comprehensive suite of contingency plans will be submitted in support of the Project EIS.

3.0 DESCRIPTION OF THE ENVIRONMENT

3.1 TERRAIN AND GEOLOGY

The landscape of the region is low relief tundra. The road alignment rises to 400 m above sea level (asl) near km 10 and remains in the 400 - 450 m asl range all the way to Contwoyto Lake. The elevation of Contwoyto Lake is 445 m+/- (see NTS 76E).

The bedrock and surficial geology of the Project region is typical of the Precambrian shield; bedrock outcrops are common, glacial landforms such as eskers and drumlins are common with shallow lakes everywhere in sight. Examination of the lakes and other land forms along the alignment suggests that none of the lakes along the route are of great depth; similarly, the frozen tundra soils overlying the bedrock are a mere few metres thick for most of the alignment except in the area of the port where marine sediments of greater depth are expected in the first five kilometres of the route (Nishi-Khon/SNC-Lavalin and Kitikmeot Geosciences, 2002).

The chemical composition of the rock types along the road alignment was investigated to assess the potential for acid generation (Rescan 2003a). Acid generation occurs when naturally occurring sulphur in the form of sulphide in native rock is exposed to, and combines with, oxygen from the air. The run off from an area of rock with high sulphide content is usually mildly acidic. Acidic run off from man made structures of native rock can be mitigated by blending acid generating rock with basic rock so that the acidic run off is neutralized. A more satisfactory mitigation strategy would be to avoid using road-building materials that show acid generation potential. The occurrence of rock with sulphide content that has the potential to produce acid drainage was noted along the road alignment at km 99 - 104 on the Port/Contwoyto road.

Further to the field studies, acid base accounting (ABA) analysis was conducted on rock samples collected along the route. Although the samples collected from km 99-104 were not proven to be acid generating through ABA analysis, it should be noted that the samples came from a highly weathered shear zone, and that the potential exists for sulphides in the unweathered rock below the surface. ABA analysis indicated an uncertain potential to generate net acidity in an additional two areas other than those determined in the field. These sample locations are at km 65.7 and 194.5.

The risk of earthquake hazard in the Project area is rated in the lowest risk category projected on a Canada wide scale (Adams et al. 1999).

3.2 CLIMATE AND PERMAFROST

The climate of the Project area is characterized by short cool summers and long cold winters. Weather records from the Project area have been collected continuously since 1956 when a weather station was established on Contwoyto Lake. This weather station was shut down and records for the region were collected at Lupin since 1983. Figures 10 to 20 summarize the climate data collected at Contwoyto Lake, Lupin, and other locations in the Kitikmeot region.

Permafrost is a direct function of the prevailing climate over a long time. The presence of continuous permafrost in the terrain throughout the land portion of the Project shows the negative annual solar energy

budget in the region with a mean annual temperature of-11 deg. C. The depth of permafrost generally in the Project region is estimated to exceed 300 m (National Atlas of Canada). The maximum depth of thawed soils at surface in the late summer will vary depending on the type of surface cover; on bare granular sites the depth of thaw can reach 2 m (Metall, 1993) while on moss covered sites the depth of thaw will be much less. Also, permafrost is expected to be absent under large bodies of water like Contwoyto Lake and from land immediately adjacent to, and under the port site at Bathurst Inlet

Climate records (Environment Canada) for Cambridge Bay, Jenny Lind Island, and Kugluktuk are summarized in Figures 14 to 20. Marine ice thickness analyses for Cambridge Bay and Kugluktuk were prepared for the earlier Izok Project study Metall, 1993, (Figures 21 and 22), the Cambridge Bay chart has been updated to 2003. The ice regime of the shipping route is further described in Figures 23 to 25, which show the mean ice fracture dates, mid-September open water distribution, and early winter ice consolidation dates for the shipping route from Barrow Strait near Polaris Mine to Bathurst Inlet. Observations of spring ice conditions by residents of Bathurst Inlet community show that the marine ice cover recedes from mid June to early July with the Inlet being clear of ice by mid-July. In the fall the marine ice cover may reach 10 cm by late October. This is significant in that a 10 cm ice cover is adequate for both a snowmobile and caribou to cross the Inlet (Sam Kapolak, Bathurst Inlet resident).

A project specific climate-monitoring program began in late August 2001 with the installation of an automated meteorological station at the proposed Port site. The station uses an automatic data logger to record measurements of climatological elements. The design of the station was based on Environmental Canada guidelines.

3.3 AIR QUALITY

Data sets showing predevelopment air quality for the Project area are not available but will be developed as required for the Port site as well as the road. The prevailing winds for the area are north to northwest; air quality monitoring devices would be set up in appropriate locations to reflect the wind regime in relation to site configuration.

3.4 HYDROLOGY

Mean annual precipitation throughout the Project region is 250 mm with roughly equal amounts as rain in summer and snow in winter (please see Figure 11 for precipitation records for Contwoyto Lake: 1956 to 1982). Despite these low, desert-like annual precipitation rates, the low topographic relief throughout the Project area combined with the presence of permafrost provide conditions for numerous tundra lakes and ponds in the region. The tundra hydrologic regime is characterized by moisture accumulation throughout the winter in the form of snow, rapid melt and run off in June, and significant evaporation and transpiration throughout the short cool summer that is accompanied by light showers and rain. It is not unusual for tundra streams to dry up for periods following spring run off. The annual stream flow profile for small basins typical of the Project area can be represented by the Gordon River basin (1,530 km^2) as shown in Figure 26; it flows into Bathurst Inlet from the southeast. This basin was monitored by Environment Canada beginning in 1977 (Environment Canada, 1992). The data show zero flow for the months of January, February, March and April; very low flow in May and peak flows in June dropping off sharply in July and returning to zero flow by December. The extreme flow events recorded for the Gordon River shows that maximum instantaneous, and maximum daily flows (both recorded in June) are five times the mean daily flow for June. Mean annual water yield from run off for the entire basin for the Gordon River was 163 mm.

It is typical that summer evaporation and transpiration from tundra environments is roughly equal to summer precipitation, in the range of 100 - 150 mm (Environment Canada, 1978; UNESCO, 1976).

Detailed terrain analyses of the road alignment shows that 111 stream crossings will be required along its entire length. Figure 32 shows the road alignment in relation to drainage basins that would be bisectedby the road.

3.5 VEGETATION AND WILDLIFE HABITAT

The terrestrial habitat of the Project region is typical of sub-arctic tundra. The soils of the area are of glacial origin and are for the most part well drained, supporting numerous herb and shrub species including dwarf birch and arctic willow. Low lying areas support lush wetlands with sedges and cotton grass.

Several rare plant species have been reported for the sub-arctic region generally, and are listed in Table 9. Their presence and distribution was a primary focus of the plant and vegetation study of the Project area. None of the species indicated in Table 9 were noted in the 2001 field studies of the road alignment.

Table 9 Rare plant species recorded within or near the Izok Lake-Bathurst Inlet Transportation Link

Scientific Name	Common Name	Habitat	Nearest Location
Braya glabella	Braya	mineral soil, damp tundra	near Bathurst Inlet area
Carex morrisseyi	Sedge	minerotrophic *Larix* fens	near the study area and towards Great Bear Lake and Hudson's Bay
Gentiana tendella	Gentian	local on sandy beaches and gravelly mud flats along the Arctic coast	near Bathurst Inlet
Mertensia drummondi	Drummond's Lungwort	sandy banks and eskers; not a seashore species	west of Bathurst Inlet near coast
Ranunculus pallasii	Pallas Buttercup	wet brackish meadow and slough, *i.e.* mainly along seacoast and estuaries.	near Bathurst Inlet and to west on coast

Source: GNWT 1999 in JWEL 2001

3.6 FISH AND WILDLIFE

The Project area supports a complete assemblage of Arctic fish and wildlife species. Lists enumerating marine and terrestrial species of fish, birds, and mammals reported for the Project region indicating their preferred habitats, abundance, and distribution are provided in Tables 10-15. None of the populations of wildlife species that are likely to interact with any aspect of the Project are currently listed as "at risk" in Nunavut (Government of Nunavut, 2000; unpublished).

3.6.1 Fish - Marine

The distribution of marine fish in Canada's arctic marine environments was documented in the Project scoping study (JWEL, 2001). Table 10 summarizes those findings on the species that may be present along the marine shipping route. Species appearing in **bold print** were confirmed to occupy the Project region in collections made during 2001 field studies (Rescan 2002a).

Table 10 Marine fish species, their habitat and economic status, along the marine shipping routes serving the Bathurst Inlet Port

Species	Habitat	Economic Status
Arctic cod *Boreogadus saida*	marine, demersal	subsistence
Polar cod *Arctogadus glacialis*	marine, bathypelagic	subsistence
Toothed cod *Arctogadus borisovi*	marine, demersal	subsistence
Saffron cod *Eleginus gracilus*	marine, demersal	subsistence
Greenland cod (Ogac) *Gadus ogac*	marine, demersal	subsistence
Arctic charr *Salvelinus alpinus*	anadromous, benthopelagic	subsistence and commercial
Lake trout *Salvelinus namaycush*	freshwater/brackish, benthopelagic	subsistence and commercial
Arctic Grayling *Thymallus arcticus*	freshwater/brackish, benthopelagic	recreational use
Lake whitefish *Coregonus clupeaformis*	freshwater, brackish, demersal	subsistence
Broad Whitefish *Coregonus nasus*	freshwater, brackish, demersal	subsistence
Inconnu *Stenodus leucicthys*	inshore anadromous	subsistence
Pacific herring *Clupea harengus pallasi*	Marine, pelagic	subsistence
Arctic cisco *Coregonus autumnalis*	anadromous, pelagic	subsistence
Least cisco *Coregonus sardinella*	anadromous, pelagic	subsistence

Capelin *Mallotus villosus*	marine, pelagic	subsistence
Rainbow smelt *Osmerus mordax*	anadromous, pelagic	subsistence
Longnose sucker *Catostomus catostomus*	freshwater, inshore	subsistence
Eelpouts - 9 species *Zoarcidae sp.*	marine, demersal	
Berring wolffish *Anarhichas orientalis*	marine, demersal	
Pricklebacks - 6 species *Sticheidae*	marine, demersal/benthopelagic	
Northern sand lance *Ammodytes dubuis*	marine, pelagic	
Stout sand lance *Ammodytes hexapterus*	marine, pelagic	
Ninespine stickleback *Pungitius pungitius*	freshwater/brackish, pelagic	
Fourhorn sculpin *Myoxocephalus quadricornis*	marine, demersal	
Arctic alligatorfish *Aspidophoroides oirko*	marine, demersal	
Atlantic poacher *Leptogonus decagonus*	marine, demersal	
Leatherfin lumpsucker *Eumicrotreus derjugini*	marine, demersal	
Atlantic spiny lumpsucker *Eumicrotremus spinosis*	marine, demersal	
Gelatinous snailfish *Liparis fabricii*	marine, bathydemersal	
Dusky snailfish *Liparis gibbus*	marine, demersal	
Kelp snailfish *Liparus tunicatus*	marine, demersal	
Arctic flounder *Liopsetta glacialis*	marine, demersal	

Starry flounder *Platichthys stellatus*	marine, demersal	
Longhead dab *Limanda proboscidea*	marine, demersal	
Twohorn sculpin *Icelus bicornis*	marine, demersal	
Spatulate sculpin *Icelus spatula*	marine, demersal	
Arctic staghorn sculpin *Gymnocanthus tricuspis*	marine, demersal	
Ribbed sculpin *Triglops pingelii*	marine, demersal	
Round whitefish *Prosopium cylindraceum*	freshwater/brackish, benthopelagic	
Shorthorn sculpin *Myoxocephalus scorpius*	marine, demersal	
Sea tadpole *Careproctus reinhardti*	marine, bathydemersal	
Slimy sculpin *Cottus cognatus*	freshwater/brackish, demersal	
Bigeye sculpin *Triglops nybelini*	marine, demersal	
Bering flounder *Hippoglossoides robustus*	marine, demersal	

The conservation status of marine fish in Nunavut has not been assessed (Government of Nunavut, unpublished). Fish and fish habitat in Canada are protected under the Fisheries Act (Canada). Notes on the biology and economic status of marine fishes were taken from Stewart et al (1993) and Froese and Pauly (2003).

3.6.2 Fish - Freshwater

Numerous studies of the lakes and streams in the Slave Geological Province haveprovided information on the distribution of freshwater fish species there (Metall, 1993; JWEL, 2001). These reports were supplemented with information from Scott and Crossman (1973, Freshwater Fishes of Canada) for preparing the freshwater species list of fishes in the Project area. Studies by the Project have refined the information on the distribution and abundance of species in the drainage basins bisected by the road (Rescan 2002b, 2003b). These data will be reported in support of the Project EIS.

The river basins bisected by the road alignment include the Burnside and Back (Contwoyto Lake drains into both), Mara/ Burnside, and the upper reaches of the Western river. Numerous freshwater and anadromous

fish species are known to occupy the region. Table 11 summarizes the species that may be present in the lakes, ponds, and streams adjacent to the road alignment. While there are currently no commercial or tourist operations that are located in the immediate vicinity of the Project's proposed facilities, some of the fish species in the region offer recreational opportunity for new commercial ventures that may arise in the future as a result of the Project.

None of the fish populations of the species in the region are listed as endangered or threatened (Government of Nunavut, 2000; unpublished). Species appearing in **bold print** were confirmed to occupy the Project region in collections made during 2001 and 2002 field studies (Rescan 2002b, 2003b).

Table 11 Freshwater fish species reported for the Project area and their conservation and economic status.

Species	Habitat/ Abundance	Conservation Status *	Economic Status/ Potential
Northern pike *Esox lucius*	lake and stream uncommon	secure	subsistence and recreational use
Longnose sucker *Catostomus catostomus*	lake	undetermined	subsistence use
Round whitefish *Prosopium cylindraceum*	lake and stream	undetermined	subsistence use
Lake cisco *Coregonus artedii*	lake and stream	secure	
Least cisco *Coregonus sardinella*	lakes and streams, anadromous	sensitive	
Arctic cisco Coregonus autumnalis	lakes and streams	sensitive	
Arctic charr *Salvelinus alpinus*	lake and stream, anadromous, common	sensitive	subsistence and recreational use
Lake trout *Salvelinus namaycush*	lake and stream, anadromous, common	secure	subsistence and recreational use
Arctic grayling *Thymallus arcticus*	lake and stream, common	sensitive	recreational use
Burbot *Lota lota*	lakes and stream, common	secure	
Ninespine stickleback *Pungitius pungitius*	lakes and streams, common	secure	

Slimy sculpin *Cottus cognatus*	lakes and streams, common	undetermined	

* the conservation status of freshwater fish in Nunavut as ranked in "Nunavut Wild Species Report, 2000" (Government of Nunavut, unpublished).

3.6.3 Birds

The bird species of the Project region include migratory and non-migratory species. Migratory birds may or may not be covered by the Migratory Birds Convention Act (Canada). Most raptor species are migratory and are not protected by the federal legislation but are covered by the Wildlife Act (Nunavut). This territorial statue is administered by the Government of Nunavut Department of Sustainable Development. The Migratory Birds Convention Act (Canada) is administered by Environment Canada. Tables 12 and 13 enumerate species that are covered by territorial and federal statute respectively; providing as well some notes on distribution and economic value. The information in these tables was gleaned from Tahera (2001) and supplemented with information from Godfrey (1966, Birds of Canada). Most bird species resident in the region are summer visitors with no particular significance to the domestic economy of the communities in the region; those that do, however, are so indicated.

None of the bird species known to breed in the Project area are listed as endangered or threatened (Government of Nunavut, 2000; unpublished; GNWT, 2000).

Table 12 Birds of the Project area protected by the Wildlife Act (Nunavut)

Species*	Distribution	Conservation Status**	Economic Status
Golden eagle *Aquila chrysaetos*	terrestrial; summer resident	sensitive	
Bald eagle *Haliaeetus leucocephalus*	terrestrial ; summer resident and migratory	accidental/vagrant	
Northern harrier *Circus cyaneus*	terrestrial; summer resident and migratory	sensitive	
Gyrfalcon *Falco rusticolus*	terrestrial; summer resident and migratory	secure	
Peregrine falcon *Falco peregrinus tundrius*	terrestrial; summer resident and migratory	may be at risk	
Rough-legged hawk *Buteo lagopus*	terrestrial; summer resident and migratory	secure	
Willow ptarmigan *Lagopus lagopus*	terrestrial; summer resident and migratory	secure	recreational and subsistence use
Rock ptarmigan *Lagopus mutus*	terrestrial; summer resident and migratory	sensitive	recreational and subsistence use

Raven *Corvus corax*	terrestrial year round resident	secure	
Snowy owl *Nyctea scandiaca*	terrestrial; summer resident and migratory	secure	
Short-eared owl *Asio flameus*	terrestrial; summer resident and migratory	sensitive	

* species appearing in **bold print** have been confirmed to breed in at least one location in the Project region

** the conservation status of birds Nunavut as ranked in "Nunavut Wild Species Report, 2000" (Government of Nunavut, unpublished).

Table 13 Birds of the Project area protected by the Migratory Birds Convention Act (Canada)

Species*	Distribution	Conservation Status**	Economic Status
Red-throated loon *Gavia stellata*	summer resident	secure	
Arctic loon *Gavia arctica*	summer resident	secure	
Yellow-billed loon *Gavia adamsii (Gray)*	summer resident	secure	
Tundra swan *Cygnus columbianus*	summer resident	secure	
White-fronted goose *Anser albifrons*	summer resident	secure	recreational and subsistence use
Canada goose *Branta canadensis*	summer resident	secure	recreational and subsistence use
Brant *Branta bernicla*	summer resident	secure	recreational and subsistence use
Green-winged teal *Anas crecca*	summer resident	undetermined	recreational and subsistence use
Northern pintail *Anas acuta*	summer resident	sensitive	recreational and subsistence use
Canvasback *Athya valisineria*	summer resident		recreational and subsistence use
Greater Scaup *Aythya marila*	summer resident	undetermined	recreational and subsistence use
Oldsquaw *Clangula hyemalis*	summer resident	secure	recreational and subsistence use
Common eider *Somateria mollissima*	summer resident	sensitive	recreational and subsistence use

King eider *Somateria spectabilis*	summer resident	sensitive	recreational and subsistence use
White winged scoter *Melanitta fusca*	summer resident	undetermined	recreational and subsistence use
Black scoter *Melanitta nigra*	summer resident		recreational and subsistence use
Surf scoter *Melanitta perspicillata*	summer resident		recreational and subsistence use
Red-breasted merganser *Mergus serrator*	summer resident	secure	
Common merganser *Mergus merganser*	summer resident		
Sandhill crane *Grus canadensis*	summer migrant	secure	
Lesser golden plover *Pluvialus dominica*	summer resident	secure	
Semipalmated plover *Charadrius semipalmatus*	summer resident	undetermined	
Lesser yellowlegs *Tringa flavipes*	summer resident	undetermined	
Ruddy turnstone *Arenaria interpres*	summer resident	secure	
Sanderling *Calidris alba*	summer resident	secure	
Semipalmated sandpiper *Calidris pusilla*	summer resident	sensitive	
Least sandpiper *Calidris minutilla*	summer resident	sensitive	
White-rumped sandpiper *Calidris fuscicollis*	summer resident	secure	
Baird's sandpiper *Calidris bairdii*	summer resident	secure	
Pectoral sandpiper *Calidris melanotos*	summer resident	secure	
Stilt sandpiper *Calidris himantopus*	summer resident	undetermined	
Common snipe *Gallinago gallinago*	summer resident	sensitive	

Red-necked phalarope *Phalaropus lobatus*	summer resident	sensitive	
Northern phalarope *Lobipes lobatus*	summer resident		
Pomarine jaeger *Stercorarius pomarinus*	summer resident	secure	
Parasitic jaeger *Stercorarius parasiticus*	summer resident	secure	
Long-tailed jaeger *Stercorarius longicaudus*	summer resident	secure	
Glaucous gull *Larus hyperboreus*	summer resident; colonial nesting on coastal cliffs and islands	secure	eggs are gathered
Thayer's gull *Larus thayeri*	summer resident; nesting on coastal cliffs and islands	not assessed	
Herring gull *Larus argentatus*	summer resident; colonial nesting on coastal cliffs and islands	secure	eggs are gathered
Sabine's gull *Xema sabini*	summer resident	secure	
Arctic tern *Sterna paradisaea*	summer resident	secure	
Common nighthawk *Chordeiles minor*	summer resident		
Horned lark *Eremophila alpestris*	summer resident	sensitive	
Cliff swallow *Hirundo pyrrhonota*	summer resident	secure	
Bank swallow *Riparia riparia*	summer resident		
Northern wheatear *Oenanthe oenanthe*	summer resident	undetermined	
Gray-cheeked thrush *Catharus minimus*	summer resident	secure	
American robin *Turdus migratorius*	summer resident	secure	
Water pipit *Anthus spinoletta*	summer resident	sensitive	

Yellow warbler *Dendroica petechia*	summer resident	undetermined	
Yellow-rumped warbler *Dendroica coronata*	summer resident	undetermined	
Blackpoll warbler *Dendroica striata*	summer resident	may be at risk	
American tree sparrow *Spizella arborea*	summer resident	sensitive	
Savannah sparrow *Passerculus sandwichensis*	summer resident	secure	
White-crowned sparrow *Zonotrichia leucophrys*	summer resident	sensitive	
Harris's sparrow *Zonotrichia querula*	summer resident	sensitive	
Lapland longspur *Calcarius lapponicus*	summer resident	secure	
Smith's longspur *Calcarius pictus*	summer resident	secure	
Snow bunting *Plectrophenaz nivalis*	summer resident	sensitive	
Common redpoll *Carduelis flammea*	summer resident	secure	
Hoary redpoll *Carduelis hornamanni*	summer resident	secure	

* species appearing in **bold print** have been confirmed to breed in at least one location in the Project region .

** the conservation status of birds in Nunavut as ranked in "Nunavut Wild Species Report, 2000" (Government of Nunavut, unpublished).

3.6.4 Mammals - Terrestrial

All terrestrial mammals in Nunavut, including polar bear, are protected by the Wildlife Act (Nunavut). This territorial statute is administered by the Government of Nunavut Department of Sustainable Development. The distribution and economic status of mammals in the Project area is summarized in Table 14.

Table 14 Terrestrial mammals reported to occupy the Project area.

Species	Habitat and Distribution	Conservation Status*	Economic Status
Masked Shrew *Sorex cinereus*	expected throughout Project area	not assessed	

Arctic hare *Lepus arcticus*	expected throughout Project area	secure	recreational and subsistence use
Arctic ground squirrel *Spermophilus parryii*	expected throughout Project area; inactive in winter	secure	occasional subsistence use
Tundra redback vole *Clethrionomys rutilus*	expected throughout Project area	undetermined	
Brown lemming *Lemmus sibiricus*	expected throughout Project area	secure	
Greenland collared lemming *Dicrostonyx torquatus*	expected throughout Project area		
Tundra vole *Microtus oeconomus*	expected throughout Project area	not assessed	
Wolf *Canis lupus*	expected throughout Project area	sensitive	recreational, subsistence and economic value
Arctic fox *Alopex lagopus*	expected throughout Project area	secure	economic value
Red fox *Vulpes vulpes*	expected throughout Project area	secure	economic value
Grizzly bear *Ursus horribilis*	expected throughout Project area; inactive in winter	sensitive	recreational, and economic value
Short-tailed weasel *Mustela erminea*	expected throughout Project area	secure	
Least Weasel *Mustela nivalis*	expected throughout Project area	not assessed	
Wolverine *Gulo luscus*	expected throughout Project area	sensitive	recreational, subsistence and economic value
Barren-ground caribou *Rangifer tarandus*	migratory; historic calving ground in Project area	secure	recreational, subsistence and economic value
Muskox *Ovibos moschatos*	expected throughout Project area	secure	recreational, subsistence and economic value

* the conservation status of terrestrial mammals in Nunavut as ranked in "Nunavut Wild Species Report, 2000" (Government of Nunavut, unpublished).

3.6.5 Mammals - Marine

Marine mammals in the Project shipping lanes include the same species that the current marine shipping would encounter in Lancaster Sound and Coronation Gulf; seals, whales and walruses (Chapman and Feldhamer, 1982; JWEL 2001). These species are protected by the Fisheries Act (Canada) which is administered by the Federal Department of Fisheries and Oceans. Table 15 enumerates the species that are

reported for the shipping route and for Bathurst Inlet and also indicates their conservation and economic status in the northern economy.

Table 15 Marine mammals reported for the shipping lanes serving the Bathurst Inlet port.

Species*	Distribution	Conservation Status**	Economic Status
Ringed seal *Phoca hispida*	throughout marine east and west shipping routes	secure	important subsistence use in coastal communities
Bearded seal *Erignathus barbatus*	throughout marine east and west shipping routes	secure	important subsistence use in coastal communities
Bowhead whale *Balaena mysticetus*	western route to Amundsen Gulf and eastern route to Lancaster Sound; endangered species	at risk	harvest in Nunavut by special permit of the Minister for DFO
Beluga *Delphinapterus leucas*	western route and eastern route in Lancaster Sound	sensitive	important subsistence use in coastal communities
Narwhal *Monodon monocerus*	eastern route in Lancaster Sound	secure	important subsistence use in coastal communities
Walrus *Odobenus rosmarus*	western route to Amundsen Gulf and eastern route to Barrow Strait	secure	important subsistence use in coastal communities

* species known to be resident in Bathurst Inlet are shown in **bold print**

** the conservation status of marine mammals in Nunavut as ranked in "Nunavut Wild Species Report, 2000" (Government of Nunavut, unpublished).

3.7 TRADITIONAL KNOWLEDGE

The Project area has been occupied by Inuit for many generations as shown by archaeological remains on the land. Inuit families living in Kitikmeot communities today lived at various locations in the Project area within the past 50 years and have an intimate knowledge of the land, the waters, andthe fish and wildlife that they harvested. Two different projects have undertaken to document the traditional knowledge of elders in the region. The Naonaiyaotit Traditional Knowledge Project (NTKP) documented responses by elders from the West Kitikmeot Region of Nunavut to a set of 145 questions on 10 specific land based themes. The Tuktu Nogak Project focused on traditional knowledge of caribou. In both projects the resulting information was compiled in geographic referenced databases. Access to the NTKP database remains proprietary until the necessary verification of the data sets are completed. When both traditional knowledge data bases are accessible, the information that is relevant to the Project development sites and road alignment will be extracted and examined to ensure that Project plans are, or can be made to be, compatible with important features like burial sites and traditional carnivore dens that may be at risk of disturbance in the present alignment and site configurations. This information will be submitted in support of the Project EIS.

3.8 HERITAGE RESOURCES

Survey of heritage resources and archaeological sites along the proposed road alignment beginning at Contwoyto Lake and terminating at the port site on Bathurst Inlet was completed in July and August 2001.

and August 2002. In 2001 the survey area included the entire Project area, which focused on sites that showed high potential in a preparatory study of landforms and other terrestrial features of the general area of the road and port, as well as previous archeological studies in the region. Specific objectives of the 2001 fieldwork included confirming the location and condition of known sites in the Project area as well as recording new, previously unrecorded sites. This field work included an aerial overview of the project area, foot traverses and visual inspections of areas with high potential, and shovel testing for the presence of artifacts and other evidence of human occupation (Fedirchuk McCullough & Associates, 2001; unpublished).

Additional survey was completed in 2002 at the Bathurst Inlet port site and the proposed bridge crossing at Amagok Creek, along with further study of a stone feature site near George Lake (FMA Heritage Resources Consultants Inc, 2003; unpublished). The 2002 field study was included in a work plan based on the results of the 2001 field study and approved by the Nunavut Chief Archaeologist.

Due to the heritage resources survey in 2001 and 2002, an inventory of 69 heritage resources sites in the Project area was developed including:

- 37 precontact artifacts scatters
- 15 precontact stone feature sites
- 13 precontact isolated finds
- 2 historical/traditional sites
- 1 precontact campsite
- 1 mixed type sites

Please see Figure 27 for the locations and distributions of known heritage sites in the Project area.

Presentation of the results of the heritage resources survey took place during public meetings with members of the local Inuit communities in January to April of 2002. Additional meetings with the elders of Kugluktuk and Cambridge Bay were conducted separately in May 2002, to present the survey results and discuss any concerns regarding the preservation and/or mitigation of heritage resources sites relative to the Project.

While survey of all Project areas is now complete, mitigation of the port facility on Bathurst inlet remains to be conducted. Further study and mitigation of the port site heritage resources will be included in future work plans, as will elder and community consultation regarding the port site heritage resources sites. The combined data of survey, consultation and mitigation will be used for impact assessment and to develop a heritage sites mitigation plan for use during project construction.

3.9 SOCIAL AND ECONOMIC SETTING

A social and economic profile of the Kitikmeot Region of Nunavut is provided in the Draft West Kitikmeot Regional Land Use Plan (1997). The traditional land use areas of each of the West Kitikmeot communities- Kugluktuk, Bathurst Inlet, Umingmaktok, and Cambridge Bay - were provided by the Nunavut Planning Commission and are shown in Figures 28 to 31 in relation to the proposed Project.

Census Canada data (collected in 2001) for the region showed a population of 4,816 with 4,334 Inuit comprising 90% of the overall population of the region. The largest communities in the West Kitikmeot Region are Cambridge Bay (population of 1,310 in 2001), and Kugluktuk (population 1,215 in 2001). The populations of each community were in periods of rapid growth, in that both will double in size within a generation. The population projections for Cambridge Bay and Kugluktuk for 2005 are 1,581 and 1,556 respectively (Dillon, 2001). In both communities more than 50% of the population was less than 25 years of

age and at the current rate of growth, that characteristic is unlikely to change. The social and economic profile of the region will be updated in the Project EIS based on the full 2001 Census Canada data.

The draft West Kitikmeot Regional Land Use Plan emphasized the importance of traditional land based activities to the economy of the West Kitikmeot. The overall labour force of Cambridge Bay and Kugluktuk showed an unemployment rate of 23%. Both communities showed a significant number of adults with less than Grade 9 education.

Tables 16, 17, and 18 provide social and economic profiles prepared in a study of Kitikmeot communities for the Hope Bay Joint Venture (Hornal 2000; courtesy of Miramar Mining Corporation) and updated with some data from the 2001 Canada Census.

A more comprehensive description of the social and economic setting of the region is in preparation and will be submitted in support of the Project EIS. This will include an assessment of the capacity of the labour force and businesses in the region to participate in the construction and ongoing operations of the Project.