5.2.3 Terrestrial interactions

All land based activities at the port will be contained to the 150 ha of the site development. The dominant activity will be truck traffic from the road to the fuel depot and to the concentrate storage building. It is expected that most of the fuel will be moved out in the January - April period that the Contwoyto ice road is in place. Also, 75% of the concentrate will be hauled during the Contwoyto ice road period. No cargo will be moving in either direction during the period that the ice road is impassable and the barge is laid up, expected to be late April to mid-July, and late October to mid-January when full ice road operations are expected to begin. The summer/fall hauling to/from the port via the barge on Contwoyto Lake will involve about 25% of the Izok concentrate and 15% of the total supplies for Lupin, Jericho, and Izok (see Tables 20 and 22). Dust management from road operations will be practised. Dust control for base metal concentrates handling at the port will be practised as required.

5.2.3.1 Birds

The port area is habitat for migratory upland tundra breeding birds as well as ptarmigan and raptors (see Tables 13 and 14 for birds of the area). Preliminary surveys of the area in 2001 showed no concentration of breeding birds in the area nor any evidence of species designated for special conservation status. Raptor nesting at the port was not reported from 2001 studies. Further surveys are planned for the area. A full review of data and information from related literature will be developed and submitted in support of the Project EIS.

Interactions of port operations with birds will be passive with no effects that are incremental to those of habitat alteration during construction.

5.2.3.2 Mammals

The upland habitat of the port is suitable for lemmings, voles, ground squirrels and arctic hare, all of which should be expected there.

Studies in 2001 did not identify any carnivore dens in the port area. The area is within the normal range of foxes, wolves, wolverine and grizzly bear. All should be expected in the area at any time of year other than grizzly in winter.

The port area is muskox range and they should be expected in all seasons.

Historic data on the distribution of the Bathurst caribou herd calving grounds show that the port site and adjacent lands were occupied for caribou calving of "medium density" in 1986. This was the only calving activity noted in the vicinity of the port area in fourteen surveys reported in the 1965 to 1996 period (Sutherland and Gunn, 1996). Bathurst herd calving grounds since 1996 have been 100 km or more to the west of the port site. Monitoring caribou use during the calving season of traditional calving grounds near the Prudhoe Bay oil development in Alaska showed that calving grounds continued to be used following initial oil field infrastructure (roads and pipelines) development on the calving ground (Dau and Cameron, 1986; LGL, 1994; Murphy and Lawhead, 2000).

Interactions of port operations with mammals will be passive with no effects that are incremental to those of habitat alteration during construction.

5.3 Environmental effects of road and Contwoyto Lake barge terminals construction

The total length of the proposed road will be 290 km. Construction will be spread over 24 months. It will be built in three sections; the first from the port (km 0) to km 126, from Contwoyto Lake (km 210) to km 126, and from Lupin to the Izok Project. Km 0 to km 126 will be built in the October 2004 to October 2005 period starting at the port. Km 210 - km 126 will be built in the January 2005 to October 2005 period starting from Contwoyto Lake as soon as the 2005 Lupin winter road allows mobilizing the construction equipment to Contwoyto Lake.

5.3.1 Air quality

The dominant environmental effect road and barge terminal construction will be dust, noise, and exhaust emissions. Construction noise will be mitigated by use of appropriate personal protective equipment. Dust will be produced from rock crushing and road construction. The working environment effects of dust, like noise, will be mitigated by use of appropriate personal protective equipment. Exhaust emissions will be reduced by an overall fuel conservation effort.

5.3.2 Aquatic environments

Field studies in 2001 found 10 species in the streams that cross the road alignment (see Table 12 for species of freshwater fish in the Project area).

The road alignment is such that construction will not encroach on any lakes other than Contwoyto Lake and the north arm of Itchen Lake at its westerly terminus. Numerous drainage basins however will be bisected by the road (Figure 32). Including the crossing at Itchen Lake, the alignment requires 119 water crossings.

The overall prerequisite in the preliminary design of each of the required water crossings was to avoid encroaching on the stream channel (other than during extreme flows) in streams known and expected to be fish bearing and so avoid disturbing potential fish habitat. The design for such crossings are either single span bridges or arched culverts. For crossings at intermittent streams that are not fish bearing, rock fords are proposed. These designs meet the above prerequisite for 116 of the 119 crossings. Instream abutments or double span bridges may be required at three locations: km 126.6 crossing the Mara River, km 165.5 on the port to Contwoyto portion of the road, and at km 61 of the Lupin to Izok road. Table 21 summarizes the location and preliminary design of each of the proposed water crossings for the alignment from the port to the Izok Project boundary. Also, Figures 33, 34, and 35 provide photographs and drawings of streams that show an example of each design type of water crossing proposed.

One crossing will require midspan support structures from the stream channel; the Mara River at km 126.5 requires a bridge of 60 meters, exceeding the limits of a single span. The crossing at Itchen narrows at km 61 of the Lupin Izok road will require abutments encroaching into Itchen Narrows to reduce the bridge length for a single span.

Water crossings of a rock ford design (67) will be built in winter when no flow is expected. Likewise, site development for crossings requiring bridges (31) and arch culverts (21) will be completed in late winter when working conditions improve but before stream flow is expected.

The environmental effects of water crossings along the road on aquatic life and particularly fish populations will be negligible. All data from field studies will be reported in support of the Project EIS.

Recreational angling is expected to occur by workers living at the camps at the port, the Contwoyto barge site, and at Lupin. Angling destinations by persons at the port are likely to be marine destinations on Bathurst Inlet. Contwoyto Lake will be used by anglers based at the Contwoyto barge site and at Lupin. There is an active angling community at Lupin mine which has been fishing on Contwoyto Lake for 20 years. It is expected that the species of choice by anglers will be lake trout and arctic charr. The draft West Kitikmeot Regional Land Use Plan recommends that recreational angling at resource development sites be restricted in a 5 km area "around the development site". The Project will develop a strategy so that employees and contractors will be in compliance with the plan.

Table 21. Location, watershed, and fish habitat characteristics for water crossings.

From Bathurst Inlet to Contwoyto Barge Terminal							
Final Road Chainage km	Watershed Area km²	Preliminary Habitat Quality Rating*	Est Stream Depth design - 1:25 yr m	Est Streamflow design - 1:25 yr m³/s	Crossing Type/Length Rock Fill	Arch	Bridge
					m	m	m
2.5	66.4	High	0.45	16.38			20
3.0	1.1	Low		0.63	X		
7.7	6.8	High		2.68		X	
14.3	75.3		0.83	18.09			10
18.7	1.7			0.89	X		
21.5	1143.1	Low	0.98	156.68			50
24.8	0.7			0.44	X		
25.3	0.5			0.34	X		
28.5	3.4			1.55	X		
31.5	0.3	Medium		0.23		X	
31.9	42.7	Low	0.35	11.54			30
32.9	60.5	Medium	0.39	15.21			30
33.9	43.0	Low	0.32	11.60			30
35.2	2.7			1.29	X		
36.3	0.2			0.16	X		
36.9	0.4			0.28	X		
38.6	2.6			1.25	X		
40.2	9.5	Medium	0.22	3.50			20
41.5	6.1	Low		2.46	X		
42.8	2.0	Medium		1.02		X	
45.5	2.5			1.21	X		
48.0	9.9	Medium		3.62		X	
50.5	46.3	Low	0.59	12.30			20
52.4	3.6			1.62	X		
54.0	0.7			0.44	X		
56.8	5.2	Medium		2.17		X	
60.5	0.5			0.34	X		
61.6	0.2			0.16	X		
66.5	0.5			0.34	X		
67.5	6.2	High		2.49		X	
68.2	2.3	Low		1.14	X		
70.3	39.8	High	0.46	10.91			20

Final Road Chainage km	Watershed Area km²	Preliminary Habitat Quality Rating*	Est Stream Depth design - 1:25 yr m	Est Streamflow design - 1:25 yr m³/s	Crossing Type/Length		
					Rock Fill	Arch	Bridge
72.2	3.9			1.73	X		
73.2	1.6			0.85	X		
74.0	16.0	Low	0.42	5.29			10
75.1	6.3	Low		2.53	X		
77.0	0.5			0.34	X		
78.5	2.4			1.17	X		
81.7	1.6			0.85	X		
82.1	81.0	High	0.41	19.17			30
83.0	5.0	Low		2.10	X		
88.2	2.6	Low		1.25	X		
89.1	0.5			0.34	X		
89.3	1.0			0.59	X		
91.3	2.2			1.10	X		
92.0	4.2			1.83	X		
95.5	4.4			1.89	X		
96.8	0.4			0.28	X		
98.3	1.2			0.68	X		
100.9	3.9	Low		1.73	X		
101.1	2.6	High		1.25		X	
104.3	13.4	Low	0.23	4.60			30
110.8	23.8	Low	0.34	7.25			20
111.5	1.4	High	0.14	0.77			20
112.8	18.1	Medium	0.33	5.84			20
115.0	5.0			2.10	X		
116.9	1.3			0.72	X		
121.0	0.8			0.49	X		
121.3	1.2			0.68	X		
123.0	23.8			7.25	X		
126.5	1825.6	High	1.70	227.19			60
132.0	71.0	High	0.43	17.27			30
134.1	0.7			0.44	X		
141.8	1.9			0.98	X		
144.0	2.3			1.14	X		
144.9	1.0			0.59	X		
147.1	2.7			1.29	X		
149.0	28.8		0.42	8.44			20

Final Road Chainage km	Watershed Area km^2	Preliminary Habitat Quality Rating*	Est Stream Depth design - 1:25 yr m	Est Streamflow design - 1:25 yr m^3/s	Crossing Type/Length		
					Rock Fill	Arch	Bridge
153.0	0.6			0.39	X		
155.7	0.3			0.23	X		
157.0	0.7	Low		0.44	X		
157.2	0.8			0.49	X		
158.3	15.8	High	0.33	5.24		X	
165.1	4.2	Low		1.83	X		
165.5	66.9		0.26	16.47			60
166.4	0.1			0.09	X		
166.6	0.7	Medium		0.44		X	
167.7	13.5	High		4.63		X	
170.2	9.8	High		3.59		X	
174.1	8.7			3.26	X		
178.2	352.5	High	1.03	61.60			30
180.5	4.1	Low		1.80	X		
183.4	0.6	Low		0.40	X		
186.0	4.4	Low	0.32	1.89		3	
189.3	11.3		0.55	4.02		3	
190.8	0.8			0.49	X		
193.4	1.8			0.93	X		
195.3	0.3			0.23	X		
198.7	65.6	High	0.69	16.22			20
199.7	34.4	High	0.40	9.71			20
201.2	1.0	Medium		0.59		X	
203.7	12.4		0.26	4.32			10
205.2	1.5		0.20	0.81		3	
208.0	2.1			1.06	X		

Final Road Chainage km	Watershed Area km²	Preliminary Habitat Quality Rating*	Est Stream Depth design - 1:25 yr m	Est Streamflow design - 1:25 yr m³/s	Crossing Type/Length Rock Fill	Arch	Bridge
Table 21. continued							
From Lupin Mine to Izok Site							
8.9	20.9	High		6.55		84"arch	
12.5	9.0	Low		3.35		2	
15.0	14.2			4.82		2	
17.7	103.3	High	0.44	23.25			40
30.0	23.6	Low	0.34	7.21			20
31.0	0.9	Low		0.55	X		
31.3	3.8			1.67	X		
33.0	0.9			0.53	X		
36.4	77.9	High	0.44	18.58			30
38.7	2.9			1.36	X		
39.7	0.7			0.42	X		
40.9	33.0	High	0.27	9.41			30
49.5	36.8	High	0.26	10.24			30
51.2	1.6			0.85	X		
52.1	0.7			0.45	X		
54.9	0.9			0.52	X		
58.0	38.7	High	0.19	10.66			30
59.0	0.4	Low		0.28	X		
61.0	400+	High	0.59	81.29			60
68.3	2.3	High		1.12		X	
68.7	4.1	High		1.80		X	
69.6	3.4			1.56	X		
71.2	5.4	High		2.24		X	
73.1	0.5			0.31	X		
74.0	25.2	High	0.24	7.60			40

* Preliminary fish habitat rating by Rescan 2002 - preliminary data

5.3.3 Terrestrial environment interactions

Road construction will involve developing a series of granular pits (9 required) and quarries (41 required) along the entire road alignment as shown in Figure 4. Each pit or quarry will alter approximately 2 ha. of tundra terrain and habitat. A total of 6.2 million m^3 of rock and granular materials will be removed from these pits and quarries and placed on the right-of-way to build the road. Building the road with passing pullouts every 1,000 meters will cover 381.3 ha +/- of tundra habitat. The total terrain alteration along the alignment including quarries and barge terminals will be approximately 516 ha +/-. Studies in 2001 included a terrain analysis for ecosystem mapping. The resulting maps will be used for designing and planning the environmental management system for the road right-of way.

The rough base course of rock for the alignment will be laid down in winter and so reduce thaw penetration the following summer. The additional courses of -150 mm and -50 mm crushed rock are expected to ensure that the permafrost profile migrates into the base of the road to ensure terrain stability to the road bed.

5.3.3.1 Birds

The road alignment and barge terminals are habitat for migratory upland tundra breeding birds as well as ptarmigan and raptors (see Tables 13 and 14 for birds of the area). Preliminary surveys of the area in 2001 showed no concentration of breeding birds in the area nor any evidence of species designated for special conservation status. Raptor nesting along the road alignment was not reported from 2001 studies. Further surveys are planned for the area. A full review of data and information from related literature will be developed and submitted in support of the Project EIS.

Neither the road bed or any of the pits or quarries encroach on water bodies and so no shoreline water fowl nesting habitat is at risk. Quarry and pit development, and road bed construction may displace upland nesting birds.

5.3.3.2 Mammals

The habitats along the road and at the pits and quarries are occupied by lemmings, voles, ground squirrels and arctic hare, all of which were observed in the Project area during studies in 2001.

The Project area is within the normal range of foxes, wolves, wolverine and grizzly bear. All should be expected at any point along the alignment at any time of year except grizzly in winter.

Muskox occupy the tundra traversed by the proposed road alignment and are present the whole year.

Caribou of at least two herds occupy the area of the road alignment for part of the year. The Bathurst herd will migrate across the road alignment during the calving migration of the cows in April and May and the spring migration by the non-calving portion of the herd will occur a month later. Post calving aggregations ranging in size up to tens of thousands of cows with calves may spend brief periods in the vicinity of the alignment during the later part of June and into July. Small bands of mixed herds should be expected for the remainder of the summer until late August when most of the Bathurst herd is usually on ranges further south. The likelihood of interactions with the Bathurst herd for the remainder of the year, from the fall through the winter, is low. Figures 36 a - f show the distribution of Bathurst caribou for 1996 - 2000 as shown by satellite telemetry data courtesy of the West Kitikmeot Slave Study, and Dr. Ann Gunn and her colleagues in the Government of the Northwest Territories Department of Resources, Wildlife and Economic Development.

The area of the alignment near Nose Lake and vicinity was also shown to be part of the Queen Maud Gulf caribou herd range (Gunn et al, 2000). Unlike the Bathurst herd, the Queen Maud Gulf herd does not migrate south for the winter and telemetry locations from animals in that herd showed that the area east of Contwoyto Lake was occupied by animals of this herd in the summer of 1996 and 1997 and the winter of 1997.

Construction activities will generally be concentrated on specific portions of road, 20 - 30 km stretches accessible from the particular quarries that are active. Two construction crews at most will be active at any one time in the January - October 2005 period; one crew will build the Lupin to Izok road in the November 2005 - October 2006 period. Interactions of road construction operations with mammals generally will be passive with no significant effects on the animals. Interactions with caribou may be such that construction work will be slowed or temporarily halted to allow the caribou to pass through the construction zone. This will likely be the case during the calving and spring migrations. The "invasion" of a post-calving aggregation would make road construction impossible for a period of 12 - 36 hours if the animals decided to "settle in for a feed and a rest".

5.4 Environmental effects of road and barge operations

Road operations for Izok, Jericho, and Lupin cargos will be interrupted by the seasonal constraints of traversing Contwoyto Lake. Operations to Ekati and Diavik will be winter only as dictated by the accessibility to these sites on the Lupin winter road out of Yellowknife. The seasonal traffic estimated for the first 10 years of road operations to these locations is summarized by Table 22.

Table 22. Seasonal road traffic to sites serviced by the Bathurst Inlet Port and Road Project in years 1- 10

Destination	Summer Barge	Winter	Total Trucks
Lupin	156	470	626
Ekati	0	2,827	2,827
Diavik	0	1,695	1,695
Izok	1,259	3,777	5,036
Jericho	0	331	331
Total	1,415	9,100	10,515

Road maintenance crews will be based at the port and at Lupin. Systematic maintenance activities will involve surface grading and dust suppression in summer and snow removal and grading as required in winter. Surface materials will be added from time to time as needed which will require operating several quarries along the road and crushing rock to produce the -50 mm materials for surface dressing. This work would be done during the May - July period when hauling has been suspended because Contwoyto Lake is impassable.

5.4.1 Air Quality

Truck and barge operations will produce exhaust emissions. Exhaust emissions will be reduced by an overall fuel conservation effort. Summer road traffic will produce dust which will be managed by a road watering program.

5.4.2 Aquatic environment

There will be no direct interaction between the road and the aquatic environment. The flow at non-intermittent stream crossings will reach the level of the bridge or culvert abutments only at very high flows. However, water will be required for summer road maintenance and camp needs at the Contwoyto barge camp. A pumping station for dust suppression on the road will be located every 30 km where a

water tanker will reload for dust suppression watering. Only water bodies with active summer flows will be used for pumping stations and so prevent a draw down that could affect aquatic life.

The camp at the Contwoyto barge site will require 12,000 liters water/day for potable needs and emergency fire fighting. It will be drawn from Contwoyto Lake. Standard intake screens will be in place to prevent fish from entering the water intake. Sewage treatment will be by extended aeration with effluent discharged on the tundra "field".

There will also be the risk of base metal concentrate dust escaping from loads and settling on the tundra and entering the run off. This should be addressed by the Izok Project EIS at the time of Izok Project review.

5.4.3 Terrestrial environment interactions

The principle interaction between road traffic and the elements of the terrestrial environment will be dust, as discussed above.

5.4.3.1 Birds

The interactions with birds during road and barge operations will be passive and no incremental effects to those of the construction phase are expected.

5.4.3.2 Mammals

The interactions with mammals during road and barge operations will be passive and no incremental effects to those of the construction phase are expected. It is expected that the interactions will be reduced in that the season of active traffic will be considerably shortened during road operations. The following operating seasons are expected:

- winter road operations to Ekati, Diavik, Lupin, and Izok - 90 days beginning mid-January;
- barge operations on Contwoyto Lake - 100 days beginning mid-July.

This restricted operating season will reduce interactions between haul trucks and migrating caribou during the latter period of the cows' calving migration, the non-calving herd's spring migration, and the post-calving period.

There is a considerable body of information on the interactions between caribou herds and a resource development road. The Milne Point, Kuparuk and Prudhoe Bay oil fields in northern Alaska were developed on known caribou calving and post calving grounds of the Central Arctic Herd in the early 1980's. Caribou monitoring before and after oil field development (1978-81; 1982-1987) showed that the distribution of cows on the calving ground changed; cows with calves generally avoided areas within 2 km of a service road with "moderate to heavy traffic" for up to three weeks after the peak of calving. It is noteworthy that caribou in other sex and age classes used the area closer to the road avoided by cows with newborn calves. Also, the area of the oil fields continued to be used as a calving ground after the oil fields were developed with roads, pump jacks, and pipelines built and operating. Perhaps most significant of all, the herd grew throughout this period from 6,000 in 1978 to 23,400 in 1992 (LGL, 1994).

The Western Arctic Herd ranges over northwest Alaska. The Red Dog lead-zinc mine went into operation in 1989. The Red Dog ore body is owned by the Nana Corporation, one of the native corporations established in the Alaska land claim. The mine is operated by Teck-Cominco. It required a 100 km all-weather road to service the mine and remove the concentrate to a marine port on Kotzebue Sound. This road passes through winter range and crosses migration routes of the Western Arctic Herd

with a traffic volume of at least 60 return trips per day. Like the Central Arctic Herd, it has grown and multiplied by from 75,000 to 416,000 in the period between 1976 and 1991 (LGL, 1994).

The Porcupine herd is shared between NWT, Yukon, and Alaska. The Dempster highway cut through its winter range and crosses several major migratory routes in the NWT and Yukon. Prior to construction and operation of the Dempster highway a lot of concern was expressed for the future of the herd. The road opened in 1979. In the first ten years of operations from 1979 - 1989 the herd increased by 60% from 106,000 to 163,500 (LGL, 1994).

The Alaska monitoring study compared the response of these herds with a herd that did not have any major oil field development on its range, the Teshekpuk herd, also on the Alaska North slope. It also increased fourfold from 4,000 to 16,500 in the period from 1982 - 1989 (LGL, 1994).

In the NWT and Nunavut, the Lupin winter road cuts through the winter range of the Bathurst herd and crosses spring migration routes. In the period of winter road operations (1982 to the present) the herd has increased from estimates of 100 - 120,000 in 1979 to 360,000 in 2001 (GNWT, 1988).

The effects of road operations on caribou populations will be negligible. Hunting by Project personnel and the personnel of contractors will not be permitted. Figures 36 a - f show the distribution of the Bathurst herd from 1996 - 2000 as shown by telemetry data.

5.5 Lupin winter road

The Lupin winter road will continue to operate into the Project area and freight originating in Yellowknife will include non-bulk freight destined to all the sites served by the Bathurst Port Road including cargo destined for Kitikmeot communities hauled to the port .

5.6 Bathurst Inlet port and road operations effects on the social and economic environment of Kitikmeot

The Project construction phase and operations provide a significant potential for jobs to workers in the region. Project construction will create 3600 man-months of work over a 30 month period with a payroll of $34.5 M. Operations will create 800 man-months of employment (both seasonal and full time) with an annual payroll of $3.5 M. Payroll for contract drivers will create an additional annual payroll of $9 M.

Diesel fuel costs for each of the Kitikmeot communities served by the Project could be reduced by up to one third the current price. The costs of general cargo from Yellowknife via the port will be competitive to current freight costs via Hay River. The cost of freight on general cargo out of eastern Canada or Europe is estimated to be approximately 70% less than current freight costs via Hay River.

5.7 Bathurst Inlet port and road operations effects on the social and economic environment of the N.W.T.

It is expected that much of the seasonal hauling capacity required for the winter fuel haul from the port will be provided by a contracted fleet based outside of Nunavut that would roll through Yellowknife every January en route to the port. The tanker units would likely be loaded, discharge their cargo at a tankfarm en route and travel the remaining distance to the port empty. There is one aspect of the effects of the Project on the western Canadian economy that can be measured quite directly. All the cargo imported through the port destined for existing operations (Lupin, Ekati, Diavik) is cargo currently transported

through Yellowknife. Cargo destined to the port for export to Kitikmeot communities would continue to be procured in western Canada but pass through Yellowknife instead of being routed to Hay River. Cargo imported through the port destined for Izok and concentrate from Izok for export will be incremental in that without the port the Izok Project would not be commercially feasible. Table 25 summarizes the estimated volume of Project current cargo that would be rerouted as a result of the Project.

Table 25. Estimate of current annual cargo volumes rerouted through Project facilities

Destination	loads rerouted through Project	contents
Lupin	(630)	20 M L fuel; 8300 tonnes supplies
Ekati	(2800)	100 M L fuel; 20,000 tonnes supplies
Diavik	(1700)	57.6 M L fuel; 12,000 tonnes supplies
Kitikmeot communities	12	520 tonnes supplies
Net change	-5118 loads*	

(#) = loads rerouted away from current Lupin winter road.
1 load = 45 tonnes

5.8 Environmental effects on Public Health

No aspect of the Project's construction phase nor the operations phase touches directly on the public health of any communities in Nunavut or the N.W.T. Public health and industrial workplace health and safety needs at the camps and facilities operated by the Project will served by an industrial health professional "on site" at all times. This will complement the capacity that will be on site at Diavik, Ekati, Lupin and Izok to deal with emergencies anywhere in the Project's transportation network. Also, the camps and all related facilities will be operated in compliance with all public health standards in Nunavut.

6.0 CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative environmental effects will be addressed in the Project EIS. The sites and related activities in the region assessed for cumulative environmental effects will include ongoing operations and those proposed projects that have been submitted to agencies for environmental review. These include: Lupin Mine and the Jericho Diamond Project in Nunavut; the Ekati Diamond Mine, and the Diavik Diamonds Project in N.W.T. Non mining activities that will be included in the review of cumulative effects will include traditional harvesting and tourism (including outfitting) in Nunavut.

The overall incremental environmental effect of this Project will be building and operating a port and summer and winter road network between Bathurst Inlet and the Izok Project, and a winter road network between the port and the diamond mines in the N.W.T. Serving minesites increases the volume of the cargo on the Project's road but does not increase the environmental effects of the Project in that it directs existing cargo volumes to their destinations by way of a shorter and more economical route.

Ekati

By supplying bulk goods, including fuel, to Ekati the Project will reduce the number of loads on the southern portion of the Lupin winter road by 1700. Cargo destined to Ekati will include:

- fuel - 100 Million liters
- operating supplies - 20,000 tonnes

No new or additional environmental effects on the environment of either the West Kitikmeot region of Nunavut or the North Slave region of the N.W.T. should be introduced by moving these goods by a different route.

Diavik

The Diavik diamond mine in the North Slave region of the N.W.T. is currently under construction and is resupplied by the Lupin winter road. It is slated to go into production in 2003. The bulk goods that may be procured by way of the Bathurst Port and Road Project include:

- fuel - 57.6 Million liters
- operating supplies - 12,000 tonnes

The effect of this Project supplying bulk goods, including fuel, to Diavik will reduce the number of loads on the southern portion of the Lupin winter road by 1700. No new or additional environmental effects on the environment of either the West Kitikmeot region of Nunavut or the North Slave region of the N.W.T. should be introduced by way of sourcing these goods by way of a different route.

Lupin

Lupin Mine has been producing gold since 1982. The effect of this Project supplying bulk goods, including fuel, to Lupin will reduce the number of loads on the southern portion of the Lupin winter road by 630. The bulk goods that may be procured for Lupin by way of the Bathurst Port and Road Project include:

- fuel - 20 Million liters
- operating supplies - 8300 tonnes

No new or additional environmental effects on the environment of the West Kitikmeot region of Nunavut will be introduced by way of sourcing these goods by way of a different route.

Jericho

The Jericho Diamonds Project is located 3.5 km west of Contwoyto Lake 20 km northwest of Lupin. It is currently at the project review stage. It is proposed that the Jericho site would be served by a 32.5 km extension of the Lupin winter road. The configuration of this Project would not introduce any changes to the Jericho Project. Operationally, the Jericho Project may have access to the winter road over a slightly

longer period each winter compared to the current Lupin winter road season. The proposed volumes for annual resupply to the Jericho Project are estimated to be from 157 to 312 loads annually for an 8 year period (Tahera Corporation, 2001).

The social and economic effects of the Project on the Kitikmeot region include an infusion of employment and contracting opportunities for its residents. The construction phase is expected to create 3600 man-months of employment over a 30 month period. The payroll for construction will be an estimated $34.5 M.

Project operations will create 800 man-months of work annually (300 in winter and 500 in summer) directly. Annual payroll for Project employees during operations will be $3.5 M. The services for contracted drivers hauling on the road will add $9 M for a total estimated annual payroll of $12.5 M. The creation of new opportunities close to the traditional community of Bathurst Inlet may see a return of family members to the community who moved out in recent years due to lack of opportunity there (Page Burt, Naturalist at Bathurst Inlet Lodge, personal communications).

It is possible that a significant portion of the Project payroll can be retained by the region. In a study of potential social and economic effects of a gold mine in the Keewatin, it was estimated that in addition to the direct payroll to the region, government would benefit by $22,469. for every new job created in the region that was filled by a previously unemployed person. These benefits are a combination of tax revenue and saving in social program costs (Nexus, 1997).

The cumulative effects assessment in the Project EIS will describe expected effects of the Project in concert with existing and prospective activities indicated above, with traditional and historic activities on major VECs, and social, cultural and economic make-up of the Kitikmeot region of Nunavut. It will also review the expected effects on the winter road traffic between Yellowknife and the mining sites that have traditionally been resupplied entirely by the Lupin winter road.

7.0 MITIGATION MEASURES AND RESIDUAL IMPACTS

The risk of environmental effects from Project construction and operations relate to the direct interactions between the Project and elements in the environment. The interactions and related environmental risk outlined in Table 7 above will be elaborated on here.

The overall mitigation measures that will be practised are the product of a high level of environmental care and diligence by the proponent in all Project activities. Notwithstanding the best practice, and successful mitigation measures, some interactions between the Project and the environment will have residual impacts which are described for the relevant Project activity.

7.1 Air quality

Combustion of diesel and other hydrocarbon fuels will produce greenhouse gasses which cannot be avoided. The amount can be reduced by an aggressive energy conservation effort. The residual environmental effects of burning hydrocarbons are debatable but may include global warming.

7.2 Marine shipping

Marine shipping associated with the Project will take the form of 50,000 tonne vessels and barges serving Kitikmeot communities. All shipping will be done by commercial carriers operating in compliance with the relevant Canadian laws and regulations.

The Project will go beyond the specifics of the law in mitigating the effects of shipping through the Kitikmeot Region. The shipping season will be planned so that no ship movement is required during the time of potential early winter ice cover on Dease Strait and so avoid the risk of interfering with caribou migration from Victoria Island to the Kent Peninsula. Also, no ship movement will be planned for the spring when caribou return to Victoria Island. The first ship of the season is planned for an open water arrival and so Project shipping will not interfere with human travel on the spring ice either.

No residual impacts of marine shipping are expected.

7.3 Camp operations

Interactions at Project camps with the environment will involve water quality, waste management, and wildlife. All sewage at all camps will be will be treated to meet waste water quality standards prior to discharge. All combustible waste will be incinerated on a regular basis so not to attract scavengers; non-combustible waste will be disposed of either at a solid inert waste site or be shipped out. All hazardous wastes that cannot be disposed of by the Project (i.e. used oil can be destroyed on site by a waste oil burner) will be shipped out.

A "Bear Alert" program will be used at all camps to advise personnel when grizzly bear are sighted at or near a camp.

Project employees will probably engage in recreational angling but hunting by Project personnel will be prohibited. The policy on recreational angling by Project workers will be in compliance with the West Kitikmeot Regional Land Use Plan (when approved).

No residual impacts are expected to water quality, fish populations or wildlife populations as a result of camp operations. The remains of a solid inert waste site could be visible for many generations.

7.4 Unloading ship cargo

Handling marine bulk cargos has the attendant risk of spills with associated potential effects on coastal habitats. The first defence will be a code of best practice that will be followed by the commercial carriers and their staff. Next, the Project will adopt contingency plans that employ the best practice available for Arctic conditions.

No residual impacts are expected from normal port operations. Effective contingency plans and equipment with trained personnel will be in place to reduce the risk of residual impacts from accidents.

7.5 Pit /quarry development

Pits and quarries will alter an estimated 2 ha of tundra terrain at each site for a total of +/-102 ha at approximately 51 sites. Sites for pits and quarries will be selected with care so that the terrain disturbance can be contained to as small an area as possible. Quarries in sulphide bearing rock with a risk of acid generation in the quarry or by the rock on the road will be avoided. During operations, effective contingency plans will be in place to ensure that accidents do not result in residual impacts. On closure quarry and pit walls will be sloped to avoid progressive terrain alteration, but the visual effect of pit and quarry development will remain.

Residual impacts of pit and quarry development will be restricted to stable terrain alteration.

7.6 Port site development

Port site development, like quarry and pit development will involve terrain alteration on a large scale. It is estimated that the cumulative area of all development at the port will involve approximately 150 ha. A Project environmental management system will be in place to reduce the risk of environmental effects from normal operations. Contingency plans will be in place to ensure that accidents do not cause long terms impacts.

The residual impacts of port development will be the visual and inert. These effects of terrain alteration will be evident on the tundra for many years.

7.7 Road construction

Road construction will affect a total estimated 380 ha. The alignment has been selected for its benign effects on drainage basins and terrain features like eskers. Road construction, like pit and quarry development, will be attended by rigorous attention to good practice and effective contingency plans to reduce the risk of long term environmental effects from accidents.

The presence of the road will not have any long term negative impacts on water, vegetation, or wildlife. Water crossings will be designed to avoid the stream channel in fish bearing streams during normal flows. Caribou will use the road as insect relief during periods of heavy insect infestation. The presence of the road, like the presence of an esker, will be visible for many generations.

The residual impacts of road construction will be visual and inert. These effects of terrain alteration will be evident on the tundra for many years.

7.8 Barge site development

Barge site development is akin to port site development but on a much lesser scale. Total area of the two barge sites combined is estimated to be 33 ha.; three being over lake bottom. The lake bottom that will be

covered by rock is in the zone of ice scour and so the effect on fish habitat will be minimal. Like the road, barge site construction will be completed with care and diligence. The barge site parking area and pushouts, like the road, will be areas used by caribou as insect relief during periods of heavy insect infestation. The gentle terrain of the sites is such that the risk of progressive erosion is negligible

The residual impacts of barge site construction will be the visual and inert. These effects of terrain alteration will be evident on the tundra for many years.

7.9 Port site operations

Road operations at the port will produce dust in summer which will be subject to dust suppression by watering the surfaces. Contingency plans will address the risk of spills. Sedimentation ponds will be used as a back-up for spills that could affect the quality of run off water. These ponds will be located to collect run off so that it can be tested and held for treatment, if necessary, before entering Bathurst Inlet. No freshwater systems are at risk from port site run off. Dust suppression for concentrate handling will be installed by the Izok Project as required.

No residual impacts are expected from normal port operations; effective contingency plans and equipment with trained personnel will be in place to handle accidents.

7.10 Road operations

Road operations will produce dust in summer which will be suppressed by watering the road with water drawn from ponds and lakes along the road. Water bodies will be chosen so that the draw down for dust suppression does not risk the aquatic organisms in the water body.

All trucks carrying concentrate will be covered to prevent base metal contamination of the road way. All trucks operating on the road will be required to carry the basic spill kit to handle incidental spills. A contingency plan and a mobile spill kit will be on standby at all times to handle accidental spills like a truck roll over. The road environmental management plan will show the drainage pattern for both sides of the road for the entire right of way so that effective cleanup measures can be initiated with full knowledge of the natural lay of the land.

Wildlife will always have the right of way; in the event of continuous caribou migration across the road, travel may be suspended.

No residual impacts are expected from normal road operations; effective contingency plans and equipment with trained personnel will be in place to handle accidents.

7.11 Barge operations

The environmental risk associated with barge operations relates to spill and/or loss of cargo. Strict operating guidelines will be in place to address the weather consideration. Spill contingency and containment equipment will be on the barge to reduce the risk of significant loss in the event that a mishap occurs with a loaded barge on Contwoyto Lake.

No residual impacts are expected from normal barge operations; effective contingency plans and equipment with trained personnel will be in place to handle accidents.

7.12 Loading ship and barge cargo

The commercial carriers will be expected to employ best practice in their cargo handling. The experience of Polaris and Nanisivik will be used in developing handling procedures for loading concentrate and for related spill contingency plans.

Loading barges with deck cargo and fuel in holds will follow standard practice.

The port will be equipped with a full complement of spill containment and clean-up equipment.

No residual impacts are expected from normal port loading operations; effective contingency plans and equipment with trained personnel will be in place to handle accidents.

7.13 Contingency Plans

Contingency plans that are specific to potential risks inherent in Project construction and operations will be submitted with the Project EIS. Included will be contingency plans for:

- discharging fuel from ship to tank farm;
- tank frm operations and management;
- unloading bulk materials at the port;
- storage of hazardous materials at the port;
- hauling fuel and other hazardous goods on the road and Contwoyto lake Barge;
- hauling base metal concentrate on the road and Contwoyto Lake Barge;
- transferring concentrate from truck to storage and from storage to ship.

8.0 ABANDONMENT/DECOMMISSIONING PLANS

It is expected that the Project as examined in the feasibility study (Nishi-Khon SNC and Kitikmeot Geosciences, 2002) will enhance the economics of resource development in the West Kitikmeot in a very significant way for the long term. Decommissioning the Project is therefore not foreseen. It is accepted however that elements of the Project will change and that selective decommissioning will be required from time to time.

8.1 Quarries

Quarries that are not required for maintaining the road way 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 or alter natural drainage patterns in adjacent lands.

8.2 Road

It is expected that the road 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 in the future sections of 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 revegetation of all terrestrial surfaces disturbed or altered by the Project.

8.3 Seasonal shutdown

The Project's operations plan will include seasonal, temporary, and permanent closure procedures.

Seasonal operations will include barge operations in summer and winter ice road operations in winter. The Contwoyto Lake barge will be laid up at Lupin every fall by pulling it up from the lake onto skids. Likewise, equipment used for building and operating the winter ice road on Contwoyto Lake will be laid up for the summer.

Temporary suspension of all operations might be associated with global economic factors that force the suspension of operations at all participating sites. One such factor could be a price increase of fuel oil to levels that make all mining in remote regions uneconomic. Contingency plans for such factors arising will be developed and submitted in support of the Final Project Description and Project EIS.

9.0 MONITORING AND MAINTENANCE PLANS

The Project will undertake environmental quality and public health monitoring programs as required by the Project's "licence to operate" for both the construction and operating phases. Monitoring programs are expected to be prescribed by the Project's environmental regulators for water quality generally and for public health issues specifically. Furthermore, the Project would explore collaboration with other industry parties and government in the event that a long term wildlife monitoring program were to be initiated in the Kitikmeot region of Nunavut.

The Project permitting approvals requirements includes that an Inuit Impact and Benefit Agreement be negotiated with the Kitikmeot Inuit Association. It is expected that a compliance and monitoring function will be included in that agreement.

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