With the completion of mining and ore processing (projected to be at the end of 2010), the mill and all processing circuits will be washed to recover the remaining gold and to remove any material containing cyanide and other milling reagents. All wash down water will be directed through the cyanide detoxification circuit prior to being discharged to Tail Lake.

The site will then be secured and held on a "care and maintenance" basis lasting for approximately 5 months (January to June) to await outdoor working temperatures more suitable for site disassembly. All buildings will be dismantled. Any salvageable equipment and buildings will be transported to the lay down area at Roberts Bay and shipped from site the year following closure. Non-salvageable equipment and buildings will be cleaned of potentially hazardous material and then disposed of in on-site the solid waste disposal site. Given the remote location of the Doris North Project it has been assumed that most equipment and buildings will have no salvage value and will thus be demolished and disposed of on-site. Estimates of reclamation liability were made on this basis.

The camp and other support facilities such as the sewage and potable water treatment plants and the shop may remain in place for several years to act as a base for continued exploration within the belt. These facilities will be removed once further exploration activity ceases.

2.21.1 Underground Mine

The portal entrance will be filled with a rock-fill plug and sealed with a welded steel cover to ensure the underground workings remain inaccessible in compliance with mine safety requirements. The raises will either be backfilled or covered over with a vented reinforced concrete cap to prevent access.

2.21.2 Buildings & Construction Pads

All buildings will be dismantled. Any salvageable material will be shipped off site, and scrap will be disposed of in the non-hazardous waste disposal site. The rock-fill building pads will remain in place. Any berms on the pads will be breached, and any areas that may collect surface water, will be graded to allow free drainage off the pads. Any contaminated pad surfaces will be excavated, treated where appropriate through landfarming techniques or disposed of either within the tailings containment or at the solid waste disposal site in Quarry 2.

2.21.3 All-Weather Roads & Airstrip

The all-weather roads and the airstrip will remain in place after closure. Peripheral equipment like lighting and signposting will be removed. Where culverts have been installed underneath the roads or runway, the roadway or runway will be breached and the culvert removed and roadways recontoured. This will ensure that the drainage system does not require regular maintenance in the post-closure period.

2.21.4 Fuel Tanks

The fuel tanks will be emptied, the tanks cleaned, dismantled with the demolition debris disposed of in the solid waste disposal site. The containment berms will be breached or recontoured to encourage natural drainage. The HDPE liner will be cut up, removed and disposed of in the solid waste disposal site.

2.21.5 Chemicals, Waste Oil & Explosives

Waste oil will be consumed on site in a dedicated waste oil burner specifically designed for that purpose. Unused explosives will be burned or destroyed on site and unused chemicals as well as any other hazardous waste material will be removed from site.

2.21.6 Non-Hazardous Solid Waste Disposal Site

Upon closure the non-hazardous solid waste disposal site will receive a final cover of non-PAG rock, the surface will be re-graded to blend in with the surrounding terrain, and surface drainage will be directed away from the site.

2.21.7 Rock Quarries

The walls in the rock quarries will be stabilized. All stockpiled rock material left within the quarries will be spread out or removed for use in closing out other facilities such as the solid waste disposal site. The quarry floors will be channelled to allow precipitation runoff to drain onto the surrounding tundra.

2.21.8 Jetty

The jetty will be left in place. All anchor points, attached cables etc. will be removed.

2.21.9 Boat & Plane Dock

The floating boat and plane dock will be removed. All anchor points, attached cables etc. will be removed.

2.21.10 Tailings Containment Area & Dam

Tailings will be sub-aqueously disposed of in Tail Lake at an average rate of 668 tonnes (dry weight) per day. The total proposed mass for disposal during the life of the Project is approximately 467,000 tonnes (dry weight). The tailings impoundment is sized to operate as a zero discharge facility during the two years of operation if necessary. In addition, under the most conservative water balance assumptions Tail Lake would take just over five years to reach the design Full Supply Level (FSL) of 33.5 m. A permanent spillway will constructed at this elevation. Using the most conservative water management strategy, and the associated water quality predictions, the water quality in Tail Lake will return to background water quality within a maximum of 25 years. The North Dam will be breached at this time, allowing the water level in Tail Lake to return to its pre-mining elevation of 28.3 m. The South Dam will not be breached, but considering that it is constructed on a watershed, it will have no detrimental impact on the surrounding environment. The operating intent of both the North and South Dams is therefore to retain water for a maximum period of 25 years, after which the dams will no longer serve any function, and could be breached.

The tailings containment area closure plan will entail monitoring of the water quality until such time as the water quality is within regulated discharge limits. During this period supernatant will continue to be released in a controlled manner during open water periods using the discharge pumping system into Doris outflow. Once water quality within Tail Lake has reached acceptable release standard the North Dam will be breached, allowing the water level in Tail Lake to return to its pre-mining elevation of 28.3 m. Excess water will then be allowed to overflow the containment area in an unregulated fashion through the spillway constructed through the North dam breach allowing all excess water to drain from Tail Lake into the former Tail Lake outflow. The spillway outlet will be suitably armoured to ensure long-term sustainability.

3.0 DESCRIPTION OF PROJECT ENVIRONMENT

3.1 Introduction of Baseline Studies

This section provides a description of the pre-development environmental condition and land use of the Doris North Project area. It provides an overview of; (i) the physical conditions at the project site; (ii) the aquatic and terrestrial ecosystems in the project area; and (iii) a description of how the land and resources were used prior to project development. The data summarized in this section comes from a number of environmental baseline reports that have been prepared for the Doris North Project in the past. A listing of these information sources is provided in Appendix 1.

3.2 Climate

Baseline climate data for the project area was collected at the Boston and Doris North camps during exploration (August 1993 thru 2003 with some interruptions). This site-specific climate data combined with data from three longer-term regional weather stations operated by Environment Canada (Lupin, Cambridge Bay, and Kugluktuk) were used to develop annual climate profiles for the Doris North Project site.

The Doris North site has a low arctic ecoclimate with a mean annual temperature or –12.1°C with winter (October to May) and summer (June to September) mean daily temperature ranges of -50°C to +11°C and -14°C to +30°C, respectively; and mean annual precipitation ranges from 94 mm to 207.3 mm. Annual Lake Evaporation (typically occurring between June and September) is estimated to be 220 mm.

Longer summers and milder winters in recent years is the experience of Inuit elders. The Department of Indian and Northern Affairs Canada (INAC) commissioned a technical report on the "Implication of Global Warming and the Precautionary Principle in Northern Mine Design and Closure". The Intergovernmental Panel on Climate Change (IPCC) concluded that the temperature trends indicate that some global climate change has already occurred. Their predictions for the year 2100 estimate a global mean temperature increase between 1.5 °C and 4.5 °C, with a "best estimate" of 2.5 °C. This translates into a predicted increase of up to 6 °C in the winter, 4.2 °C in the spring and about 1 °C in the summer and fall. These increases would raise the mean ambient temperature by 3.1 °C. The predictions advanced by IPCC show that climate change would eventually modify the thermal regime that currently exists at Doris North. Continuous permafrost at the Doris North site will remain, but the surface active layer may be deeper in response to the milder mean annual temperature predicted.

3.3 Geology and Topography

3.3.1 Geomorphology

The project area is coastal lowland with numerous lakes and ponds separated by glacial landforms and parallel running geological intrusions of diabase dykes and sills. The drainage basins are generally long and narrow and predominantly oriented along the north-south axis. The local topography ranges from sea level at Roberts Bay to 158 m at the summit of Doris mesa, 3 km inland. The ridge separating Doris and Tail lake drainages rises to 70 m above sea level.

3.3.2 Bedrock Geology

The Doris North Project is in the Slave Structural Province, a geological sub-province of the Canadian Shield. The region is underlain by the late Archean Hope Bay Greenstone Belt, which is seven to 20 km wide and over 80 km long in a north-south direction. The late Archean Hope Bay Greenstone Belt lies entirely within the faulted Bathurst Block forming the northeast portion of the Slave Structural Province. The belt is mainly comprised of mafic metavolcanic (mainly meta-basalts) and meta-sedimentary rocks that are bound by Archean granite intrusives and gneisses. Archean volcanic greenstone hosts many of Canada's precious and base metal mines (i.e., Yellowknife, Timmins, Rouyn-Noranda).

3.3.3 Doris North Deposit Geology

The geology in the Project area includes a network of quartz veins more than 2 km in length. The Doris Hinge occurs where the Doris Central and Doris Lakeshore veins meet in a zone of mineralization four to five metres wide and centimetres to over 40 m thick. It is visible at surface as a quartz outcrop at least 600 m long, plunging north at 10° and truncated by a cross cutting diabase dyke. The basaltic host rock is folded in shallow north-south trends, which also plunge north. Diabase dykes and sills of Proterozoic age in the basalt host rock range from 1 to 6 m thick. Most of the gold mineralization is hosted in quartz vein systems. Sulphide in these veins is low, averaging < 2% pyrite.

3.4 Acid Rock Drainage Potential

Acid rock drainage (ARD) can occur when sulphide minerals in rock are exposed to air and water. It can cause environmental degradation if allowed to enter natural water bodies. Metal leaching can also occur under near neutral conditions from rock containing soluble metals. Samples of rock from the Doris North deposit were tested by acid-base accounting (ABA) analysis and by humidity cells. In general, rock from developing the underground access ramp outside the mineralized zone will have low acid generating potential and will be suitable for use in site construction.

All rock types identified as having high or uncertain acid generating potential are either from the mineralized zone or immediately adjacent to the mineralized material, with one exception. The exception is a possible small dyke of mafic volcanic rock in the path of the underground access decline. This intrusion has a total sulphur concentration <1% and is identified as potentially acid generating. This rock will be segregated and if confirmed as ARD material will be placed back underground. All other rock types classified as having high acid generating potential are typically ore grade material and will be extracted for processing through the mill. Some waste rock close to the ore has uncertain or high acid generating potential. Some of this rock will be mined during the underground development phase, stored at surface and returned underground as backfill prior to closure to prevent ARD.

ABA testing indicates that mill tailings will have low acid generating potential.

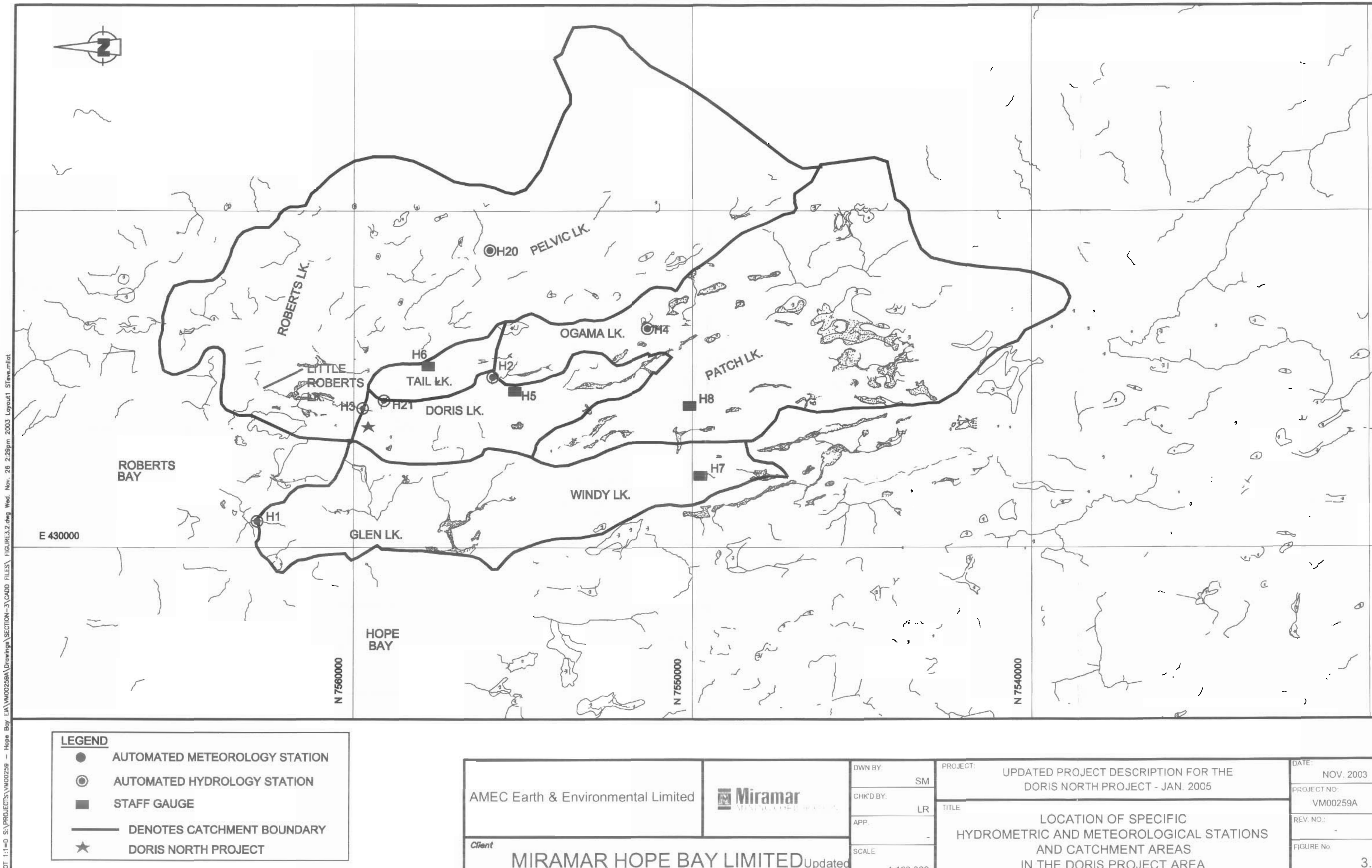
Tests on potential quarry rock showed it is not likely to be acid generating or a source of significant metal leaching and so provides clean, chemically stable construction rock.

3.5 Hydrology

The Doris North Project is located primarily in the Doris Lake outflow drainage basin (Figure 3.1). The Tail Lake basin, part of the Doris basin, is the Project's proposed tailings containment area. Peak flows typically occur in June during snowmelt. A second smaller peak may occur from rainfall in late August or early September. The streams in the study area are usually frozen with negligible flow from November until May. The mean flow from June to October for Tail, Doris, and Little Roberts Lake outflows are approximately 0.03, 0.85 and 1.73 m^3/s respectively.

3.6 Water Quality

Water quality samples were collected from Project area lakes, streams, and the nearby marine environment between 1995 and 2003. The lakes in the area are soft water lakes with neutral to slightly acid pH and low to moderate acid sensitivity. Total phosphorous levels were low, indicating oligotrophic to mesotrophic conditions. Chloride, sodium, and potassium concentrations were elevated compared to typical lakes in the Slave Structural Province. Some metal levels (i.e., total aluminium, iron, copper, cadmium, chromium, lead and manganese) in certain lakes exceed Canadian Water Quality Guidelines (CWQG) on a seasonal basis (Table 3.1). Metal concentrations were generally representative of lakes in undisturbed northern regions. In summer, the lakes were generally well mixed. Wind likely played an important role in maintaining well-mixed conditions. In shallow lakes, wind appeared to cause complete lake turnover. Winter data generally indicated a shallow upper layer of water at or near 0°C, with constant temperatures, not exceeding 2 to 3°C, throughout the remaining water column. The lakes were typically well aerated during the summer; depressed dissolved oxygen (DO) concentrations were recorded near-bottom in winter. With the exception of Ogama Lake, this DO depression occurred in lakes with relatively high total organic carbon (TOC) levels in sediments. This suggested that sediment oxygen demand (SOD) was the underlying cause. In general, water quality of the lake outflows reflected lake conditions. The majority of water quality parameters measured, including metals and nutrients, were within the recommended CWQG values.



*PLOT 1:1=D S:\PROJECTS\VM00259 – Hope Bay EIA\VM00259A\Drawings\SECTION-3\CADD FILES\ FIGURE3.2.dwg Wed. Nov. 26 2:29pm 2003 Layout1 STeve.milot

AMEC Earth & Environmental Limited	Miramar	DWN BY: SM	PROJECT: UPDATED PROJECT DESCRIPTION FOR THE DORIS NORTH PROJECT - JAN. 2005	DATE: NOV. 2003
		CHK'D BY: LR	TITLE: LOCATION OF SPECIFIC HYDROMETRIC AND METEOROLOGICAL STATIONS AND CATCHMENT AREAS IN THE DORIS PROJECT AREA	PROJECT NO: VM00259A
Client: MIRAMAR HOPE BAY LIMITED Updated		APP: -		REV. NO.: -
		SCALE: 1:100,000		FIGURE No: 3.1

Table 3-1: Baseline Water Quality Parameters That Exceeded Canadian Water Quality Guidelines in the Lakes of the Doris North Project Area

Parameter (units)	Ice Covered (April to June)				Open Water (July to Sept)				Water Quality Guidelines[b]	
	Med	Min	Max	n	Med	Min	Max	n	Drinking Water	Aquatic Life
Doris Lake (1995 - 2003)										
pH (units)	7.06	6.47	7.66	11	7.19	**5.90**	7.80	33	6.5 - 8.5	6.5 - 9.0
Total Suspended Solids (mg/L)	4	<1	11	11	4	<1	11	33		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	**4.4**	**3.0**	**10.3**	7	**4.8**	**2.1**	**8.0**	20	1	long term increase <2
Total Aluminium (ug/L)	**9**	5	19	8	40	18	**120**	27		100
Total Arsenic (ug/L)	0.40	0.30	0.62	8	0.5	<0.1	**15.0**	27	25	5
Total Cadmium (ug/L)	<0.2	<0.05	**0.42**	12	<0.05	<0.05	<0.20	31	5	0.016
Total Chromium (ug/L)	<1	0.4	<1	8	0.5	<0.5	**3.5**	27	5	1
Total Copper (ug/L)	**3.0**	**2.0**	**5.0**	12	1.3	<0.5	**2.3**	31	≤1000	2
Total Iron (ug/L)	20	<10	40	8	90	40	**720**	27	≤300	300
Total Lead (ug/L)	<1	0.12	**4.00**	12	0.26	<0.05	**1.00**	31	10	1
Total Manganese (ug/L)	<5.0	1.8	<5.0	8	12.0	5.2	**191.0**	27	≤50	
Total Selenium (ug/L)	<0.50	<0.05	<0.5	8	0.50	<0.50	**4.00**	27	10	1
Total Zinc (ug/L)	12	2	**118**	5	2.5	<1	19.0	31	≤5000[d]	30
Tail Lake (1995 - 2003)										
pH (units)	7.15	6.94	7.39	4	7.31	**5.50**	7.90	17	6.5 - 8.5	6.5 - 9.0
Total Suspended Solids (mg/L)	2	<1	3	4	2	<1	7	17		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	**3.8**	0.8	**6.7**	4	**2.1**	0.3	**5.5**	14	1	long term increase <2
Total Aluminium (ug/L)	**110**	47	**170**	3	31	19	**309**	15		100
Total Cadmium (ug/L)	<0.2	<0.2	**0.2**	3	<0.10	<0.05	0.12	15	5	0.016
Total Chromium (ug/L)	**2**	<1	**3**	3	<0.5	<0.5	**2.3**	15	5	1
Total Copper (ug/L)	**4.8**	**4.0**	**7.0**	3	1.2	<0.5	**3.8**	15	≤1000	2
Total Iron (ug/L)	213	120	**300**	3	60	40	**300**	15	≤300	300
Total Lead (ug/L)	<1	<1	**1**	3	0.11	0.05	0.50	15	10	1
Total Selenium (ug/L)	<0.5	<0.5	<0.5	3	0.5	<0.5	**4.0**	15	10	1
Total Zinc (ug/L)	6	<5	7	3	<1	<1	**85**	15	≤5000[d]	30
Ogama Lake (1995 - 2000)										
pH (units)	6.94	**6.43**	7.38	7	7.10	6.64	7.35	6	6.5 - 8.5	6.5 - 9.0
Total Suspended Solids (mg/L)	2	<1	12	7	5	4	7	6		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	**8.8**	**4.1**	**13.2**	5	**9.5**	**6.3**	**12.1**	4	1	long term increase <2
Total Aluminium (ug/L)	**261**	**216**	**300**	5	**425**	**334**	**452**	5		100
Total Cadmium (ug/L)	**0.4**	<0.2	**0.8**	7	<0.20	<0.05	<0.20	7	5	0.016
Total Chromium (ug/L)	**1.8**	1.5	**2**	5	**1.7**	<1	**2.3**	5	5	1
Total Copper (ug/L)	**5**	**2**	**12**	7	**2.0**	<1	**3.9**	7	≤1000	2
Total Iron (ug/L)	**435**	200	**650**	5	**435**	270	**580**	5	≤300	300
Total Lead (ug/L)	**1.5**	<1	**3**	7	<1	0.2	<1	7	10	1
Total Manganese (ug/L)	**170**	17	**329**	5	17	8	25	5	≤50	
Patch Lake (1995 - 2000)										
pH (units)	7.13	**6.10**	7.52	11	7.10	**6.10**	7.82	13	6.5 - 8.5	6.5 - 9.0
Total Suspended Solids (mg/L)	1	<1	4	11	1	<1	12	13		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	0.9	0.5	**4.4**	7	**3.0**	**2.5**	**4.0**	7	1	long term increase <2
Total Aluminium (ug/L)	30	7	99	8	69	22	**182**	10		100
Total Cadmium (ug/L)	<0.2	<0.05	**0.2**	12	<0.2	<0.05	<0.2	14	5	0.016
Total Chromium (ug/L)	**1**	0.7	**2**	8	<1	0.5	**2.4**	10	5	1
Total Copper (ug/L)	**3.0**	1.0	**7.0**	12	1.0	<0.5	**2.7**	14	≤1000	2
Wolverine Lake (1995 - 2000)										
Total Suspended Solids (mg/L)	2	1	5	4	2			1		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	**2.0**	**1.1**	**2.9**	4	**2.7**			1	1	long term increase <2

Table 3.1: Baseline Water Quality Parameters That Exceeded Canadian Water Quality Guidelines in the Lakes of the Doris North Project Area (continued)

Parameter (units)	Ice Covered (April to June)				Open Water (July to Sept)				Drinking Water	Aquatic Life
	Med	Min	Max	n	Med	Min	Max	n		
Total Copper (ug/L)	**3.0**	**2.0**	**3.0**	4	<1			1	≤1000	2
Total Iron (ug/L)	**360**	**300**	**400**	4	280			1	≤300	300
Total Manganese (ug/L)	42	26	**58**	4	12			1	≤50	
Windy Lake (1995 - 2000)										
pH (units)	7.52	**6.33**	7.73	5	7.58	6.90	8.00	13	6.5 - 8.5	6.5 - 9.0
Total Suspended Solids (mg/L)	<1	<1	2	5	2	<1	19	13		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	**1.2**	0.3	**2.1**	3	**1.8**	0.6	**5.0**	10	1	long term increase <2
Total Aluminium (ug/L)	14	9	19	4	42	12	**147**	11		100
Total Arsenic (ug/L)	0.40	0.20	0.6	4	1.0	0.1	**5.0**	11	25	5
Total Chromium (ug/L)	<1	<1	<1	4	**1.8**	<0.5	**5.3**	11	5	1
Total Copper (ug/L)	<2	<1	**2.0**	6	1.0	0.8	1.4	13	≤1000	2
Total Lead (ug/L)	**1**	<1	**1**	6	0.64	0.07	<1	13	10	1
Total Selenium (ug/L)	<0.50	<0.50	<0.50	4	**2.0**	<0.5	**5.0**	11	10	1
Little Roberts Lake (1995 - 2003)										
Total Suspended Solids (mg/L)	-	11	21	2	3	<1	11	9		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	-	-	-	0	1.9	0.8	**5.8**	7	1	long term increase <2
Total Aluminium (ug/L)	-	-	-	0	**209**	**53**	**343**	5		100
Total Chromium (ug/L)	-	-	-	0	<1	<1	**2.7**	5	5	1
Total Copper (ug/L)	-	**3**	**9**	2	**2**	1	**3.4**	7	≤1000	2
Total Lead (ug/L)	-	<1	**1**	2	0.50	0.15	**4.0**	7	10	1
Total Selenium (ug/L)	-	-	-	0	0.25	<0.2	**2.80**	5	10	1
Total Zinc (ug/L)	**169**	10	**327**	2	<5	<5	8	7	≤5000[(d)]	30
Pelvic Lake (1995 - 2000)										
Total Suspended Solids (mg/L)	3	<1	5	3	7	4	10	6		Short-term increase, 25; long term increase < 5
Turbidity (NTU)	**6.1**	**6.0**	**6.3**	3	**8.3**	**5.3**	**11.7**	6	1	long term increase <2
Total Aluminium (ug/L)	-	93	95	2	**147**	66	**338**	6		100
Total Copper (ug/L)	-	**13.0**	**14.0**	2	1.4	1.0	**2.0**	6	≤1000	2
Total Iron (ug/L)	-	80	110	2	298	170	**430**	6	≤300	300
Total Lead (ug/L)	-	**1**	**2**	2	**1.50**	0.08	**5.00**	6	10	1

Results listed in this table represent values measured outside the CCME guidelines. All other parameters measured were within the guidelines.

[(a)]Values in bold are equal to or greater than guidelines

[(b)]All guidelines are from CCME (1999, with 2000 updates), with the exception of the aquatic life guideline for chloride, which is from US EPA (1999). Tabled hardness and pH dependent guidelines were determined using median baseline water quality values (analytical results) from all lakes. Similarly, a temperature of 6.0 °C was used to calculate the ammonia guideline. Individual water quality values shown in this table were assessed against guidelines using median hardness and or pH for the period indicated. Average lake temperatures for ice cover (1.2 °C) and open water 10.3 °C) periods were used to assess ammonia concentrations.

[(d)] Aesthetic Objective

Marine baseline water quality sampling was conducted in Roberts Bay between 1996 and 1998. The Roberts Bay baseline data indicated a thermally stratified and well-aerated water column in shallow water during summer, temperatures near 9°C and DO concentrations greater than 11 mg/L. Turbidity and total suspended solids (TSS) levels were low during summer (1.4 NTU and 11 mg/L, respectively). Most median total metal concentrations in Roberts Bay were below detection limits and below the CWQG; exceptions were cadmium and chromium (0.0035 and 0.0026 mg/L, respectively).

Sediment samples were collected in the lakes of the project area. Metal concentrations in sediments were compared with the Canadian Interim Sediment Quality Guidelines (CISQG) for the Protection of Aquatic Life (CCME 1999). The CISQG recommends using two guidelines in assessing sediment quality: the Threshold Effect Level (TEL) - the concentration below which adverse effects are rare; and the Probable Effect Level (PEL) - the concentration above which adverse effects are likely. Most lake sediment metal levels fell below the CISQG. The exceptions were total chromium, total copper, total arsenic and total cadmium. Of these, total chromium values exceeding the guidelines were the most widespread geographically and temporally, with concentrations exceeding the CISQG PEL in three of the eight lakes (Doris, Tail and Patch). Overall sediment metal concentrations remained within the range of natural variability for the Slave Structural Province. Sediment TOC levels varied between lakes. For lake sediments with relatively elevated TOC (Doris and Tail Lakes), colour and mineralogy indicated that reducing conditions were predominant in the surface layer as well as underlying sediments. For lake sediments with relatively low to moderate TOC concentrations, colour and mineralogy indicated a strong redox gradient between an oxic surface layer and reducing underlying upper layer.

Roberts Bay sediment samples were primarily clay-sized. The exception was the shallowest station (Station S5) sample that consisted of primarily fine sand. TOC ranged from <0.05 to 0.72% dry weight, with no apparent relationship between water-column depth and TOC content. Total metal concentrations in Roberts Bay seabed sediments were, for the most part, within the sediment quality guidelines. Total chromium (66 mg/kg) and total copper (26 mg/kg) exceeded the CISQG TEL at two sites.

3.7 Sediments

Bedrock ridges, oriented north/south parallel with the dominant strike of bedrock units, show the erosive effects of the northward flowing Pleistocene (Keewatin Lobe) continental glacier ice over 10,000 years ago. The surface active layer over continuous permafrost is about 2 m thick. Drill hole logs indicate soils below the active layer contain interstitial and segregated ground ice. Most of the soils are marine in origin and include clay, silt and some sand. Drill holes along the proposed road corridor between Roberts Bay and Tail Lake shows bedrock as deep as 20 m below surface. Surface materials include frost-churned mineral and organic soils mantled by a thin cover of tundra vegetation. Patterned ground masks the underlying soils. Small, frost-heaved clay-silt polygons are common. Linear frost cracks occur in raised marine spit deposits. Ice wedge polygons are common. The entire area lies below the post-glacial marine limit of 200 m asl. Pleistocene deposits, including till, are buried beneath Holocene marine sediments deposited during the post-glacial marine emergence. Some glacial deposits were reworked by marine wave action.

Continuous permafrost extends to -560 m. Ground temperature measurements at the Doris North and Boston Camp indicate an active zone thickness ranging between 1.5 to 2.6 m and the depth of zero annual amplitude varying between 11 and 17 m. The geothermal gradient measured at the Boston Camp is about 18°C km^{-1}, corresponds to a permafrost depth of 563 m.

The Project is in the seismically "Stable" zone of Canada. This region has too few earthquakes to define reliable seismic source zones. International experience suggests that large earthquakes can occur anywhere in Canada, however slight the probability.

3.8 Freshwater and marine communities

Marine biology studies included sampling for benthic invertebrates, fisheries resources, marine mammal surveys, coastal surveys for summer bird use, and habitat assessment of Roberts Bay shorelines. The invertebrate benthos of Roberts Bay was dominated by Polychaeta, Nematodes, Pelecypoda, Cumacea and Amphipoda. Polychaeta (lugworms, tube worms and marine bristle worms) contributed to more than 50% of benthic community total numbers. The composition of benthic communities was found to be typical for Arctic and Antarctic regions. Ringed seals were the only marine mammal species identified during 1996 spring marine aerial surveys.

Aquatic biota were sampled in Doris, Tail, Ogama, Patch, Wolverine, Windy, Little Roberts, Roberts, and Pelvic lakes between 1995 and 2000, in 2002 and in 2003. Phytoplankton and zooplankton communities (taxonomic composition) among eight water bodies sampled showed little differentiation and were similar to the communities of other small lakes in the Arctic and sub-Arctic. A comparison of periphyton abundance among the study streams suggested that Doris, Ogama, and Windy outflows were highly productive and that Tail Outflow, closely followed by Pelvic Outflow, were the least productive. Phytoplankton chlorophyll a samples were collected three times during the open water period in 2003 to ascertain productivity levels within five lakes. Tail Lake was the least productive of the lakes sampled with a mean chlorophyll a value of 0.75 mg/m^3, while Doris Lake had a mean value of 7.71 mg/m^3. The benthic communities of the eight study lakes sampled were similar in many respects to the communities of other small lakes in the Canadian Arctic and sub-Arctic.

3.9 Fish Populations

Seven fish species occur in the Doris North Project area: Arctic Char, broad whitefish, cisco, lake trout, lake whitefish, least cisco, and ninespine stickleback. Lake whitefish and cisco accounted for approximately 90% of the catch in Doris, Ogama and Pelvic Lakes. Lake trout were more dominant in Patch and Windy Lakes. Only lake trout inhabit Tail Lake, although ninespine stickleback were documented in the stomachs of two lake trout there. Fish populations in Little Roberts Lake included Arctic char, broad whitefish, least cisco, cisco, lake trout, lake whitefish, and ninespine stickleback. A waterfall (4.5 m) between Doris and Little Roberts lakes prevents passage of diadromous fish species like Arctic char and broad whitefish into the Doris Lake drainage. Little Roberts Lake is used by Arctic char during their migrations between Roberts Lake and the ocean.

Streams in the Doris North study area were inhabited by eight fish species. Arctic char were the most common (61% of total catch); most of these fish were captured at a fish fence installed in Roberts Outflow during 2002 and 2003 to monitor the number of migratory Arctic char from