3.0 REVIEW OF PAST MINING PRACTISES

This section provides a brief overview of the existing operational practises at the Lupin Mine. Many similarities will exist between the Ulu and Lupin sites; camp facilities, water supply, fuel storage, winter road operation, etc. As well, all processing of ore mined from Ulu during exploration and mining will be done at the Lupin site. It is important to demonstrate the infrastructure and operations that have lead to Lupin's successful operation for the last 14 years.

Documents used to compile this section are as follows:

A Submission to the Northwest Territories Water Board in Support of an Application for Water Licence Renewal, Water Licence No. N7L2-0925, December 1994, submitted to NWT Water Board. See Appendix 11.

Abandonment and Restoration Plan, Water Licence N7L2-0925, January 1996, submitted to NWT Water Board. See Appendix 14.

Lupin Operation General Information, Echo Bay Mines Ltd., October 1996. See Appendix 10.

Lupin Operation Emergency Procedures, Echo Bay Mines Ltd., October 1994.

Contingency Plan Prepared for the Northwest Territories Water Board, Water Licence N7L2-0925; Lupin Operation, November 1995, revised April 1996. See Appendix 13.

Transportation Emergency Response Plan, Echo Bay Mines Ltd. Winter Road Operations, revised November 1995. See Appendix 16.

Highway and Winter Road Drivers' Policy and Procedures Manual, Echo Bay Mines Ltd. See Appendix 15.

A Field Guide to Ice Construction Safety, Northwest Territories Transportation.

Aquatic Studies Program - Addendum Fish Tissue Metal Analysis, RL&L Environmental Services Ltd. and Reid Crowther & Partners Limited, April 1985.

Fisheries Investigations at the Lupin Gold Mine, Contwoyto Lake, NWT, 1990, RL&L Environmental Services, September 1991.

1981- 1994 Fish Data Summary, with an Emphasis on Lake Trout, Contwoyto Lake Study Area, NWT, RL&L Environmental Services Ltd., July 1996.

Movements of Lake Trout in Sun Bay and the West Arm of Contwoyto Lake, NWT, 1994-1995, RL&L Environmental Ltd., July 1996.

3.1 LUPIN MINE

The Lupin Mine is located on the west shore of Contwoyto Lake in the Northwest Territories, approximately 400 kilometres northeast of Yellowknife and 80 kilometres south of the Arctic Circle. The coordinates are 65° 46' latitude and 111° 14' longitude (Figure 9). The mine is situated on crown land.

The mine began production in 1982. On April 28, 1993, a major milestone was reached when the mine poured it 2,000,000th troy ounce of gold. Approximately 2,000 tons of ore are processed daily to recover almost 170,000 ounces of gold annually. The Lupin mill has the capacity to process up to 2,400 tons per day. Lupin ranks among North America's largest gold producers. Reserves, as of December 31, 1994, were 2.28 million tonnes of proven and probable ore at a grade of 9.90 grams of gold per tonne.

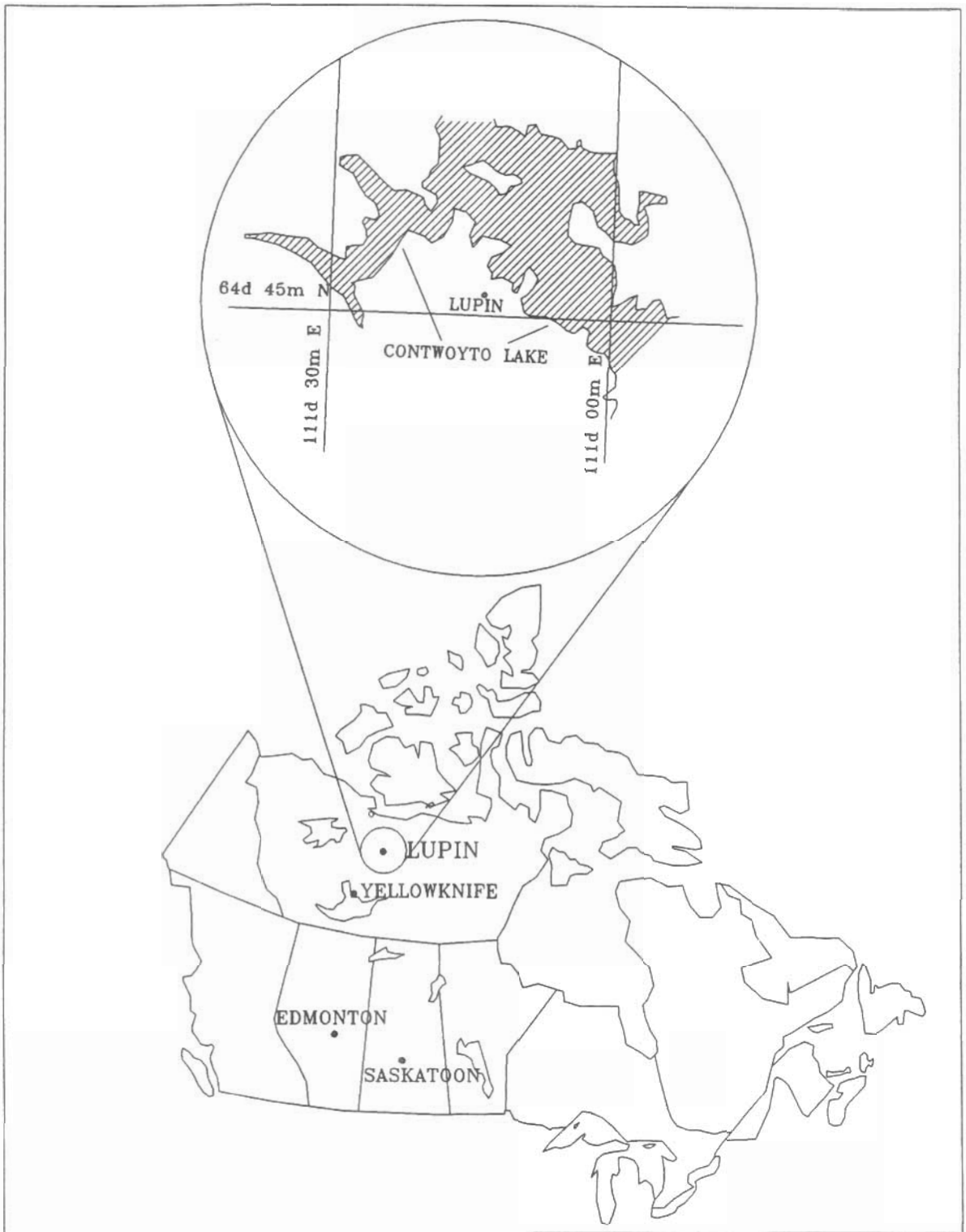
3.1.1 Existing Conditions

Site Facilities and Information

Other than the transportation requirement for materials and supplies necessary to sustain the workforce and industrial operations, the Lupin site is completely self contained and relatively compact; the mine site and ancillary buildings cover an area of about 50 hectares and the tailings containment area covers about 750 hectares.

The mine site has two main complexes: the residential complex consisting of accommodations for up to 400 people, kitchen and recreation centre and the industrial complex comprised of milling and maintenance areas, headframe, hoistroom, powerhouse, warehouse and office facilities. Figure 10 shows the mine site plan.

Ancillary to the two main complexes are a variety of materials storage facilities, the largest being the fuel tank farm. This bermed facility has an underlying plastic liner for spill containment and has a holding capacity greater than 110 percent of the volume of the largest tank. The tank farm contains fuel storage tanks comprising a volume of over 18 million litres.



ECHO BAY MINES LTD.
LUPIN N.W.T.

LOCATION MAP

Fig. 9

ECHO BAY MINES LTD.

Lupin Operation Site Plan

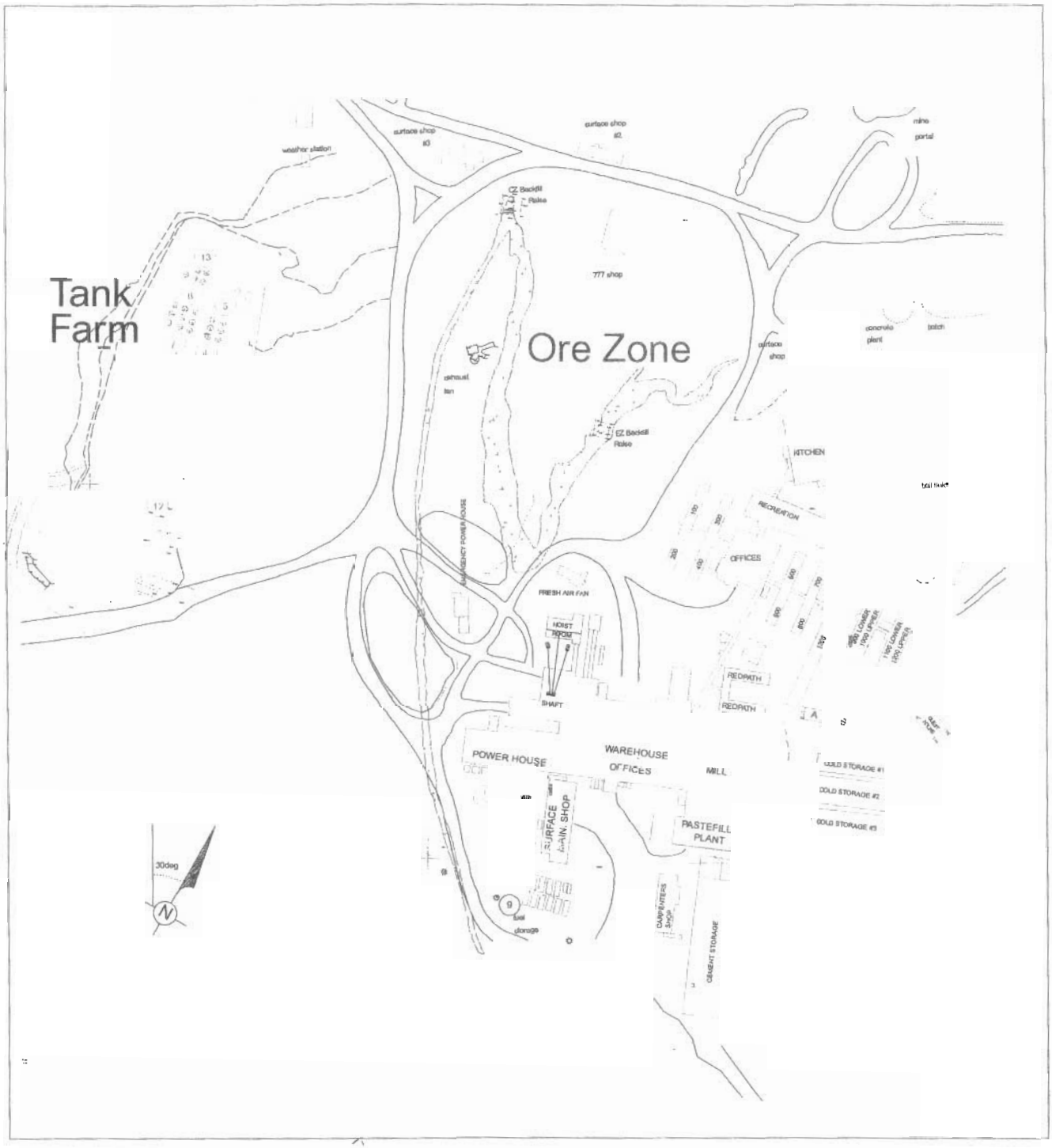


Figure 10

Power generation consumes the largest volume of fuel at the Lupin site. The installed generator capacity is 19.5 megawatts in the main powerhouse. This is provided by three Ruston RK diesel generators, four General Motors EMD645E4B diesel generators and an EMD710G4B diesel generator. In an emergency situation, an additional 1.2 megawatts of electricity can be produced from two Caterpillar D398 diesel generators enclosed in a separate building.

Fuel is utilized to its greatest extent. The waste heat produced during power generation is harnessed by circulating a mixture of 50/50 glycol and water through heat exchangers absorbing the conductive waste heat from hot lubricating oil, jacket water and exhaust gases. The glycol is then pumped throughout the minesite where heat is required for use in unit heaters and baseboard heaters. The fresh air supply to underground, offices, accommodations, kitchen facilities and the domestic hot water are all heated by means of the waste heat recovery system. The Lupin powerhouse currently generates power with a fuel efficiency of 3.85 kilowatts per litre of fuel.

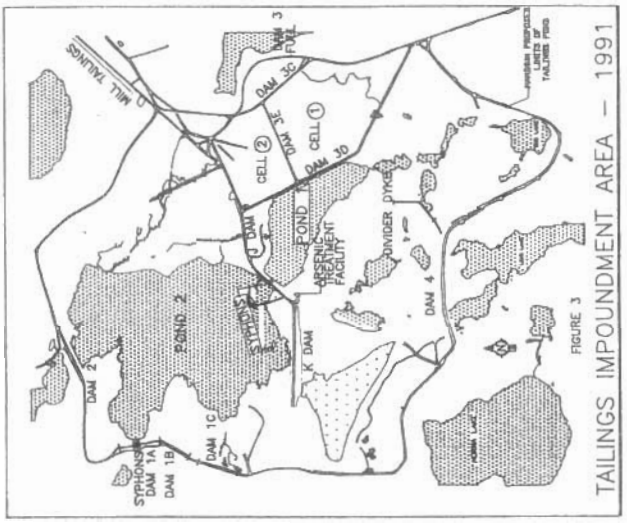
A pump house equipped with 3 3-stage Byron Jackson vertical turbine pumps (1 is standby), is situated on the shore of Contwoyto Lake to supply fresh water to the complex via an insulated 6 inch diameter pipeline. Potable water is treated using a UV disinfection unit. Typically, 130,000 m^3 of water per month is pumped from the lake, with about 9,000 m^3 being used for domestic purposes.

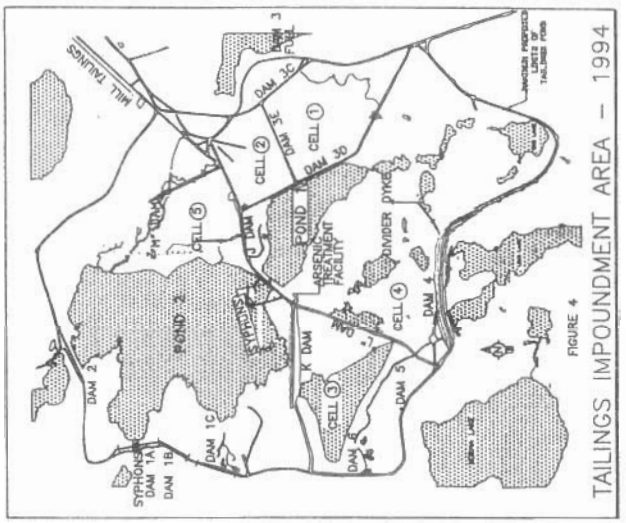
Sewage is handled through a two-celled treatment facility. A series of lift stations within the residential and industrial complex areas transfer sewage through an 500 metre long, six inch diameter insulated steel pipeline to the first of two sewage "lakes". A permeable dam with a syphon exists between the first and second lakes. Annual discharge from the second lake to the environment is controlled with a gated culvert and must meet legislated water quality requirements as indicated by Water Licence N7L2-0925 (see Appendix 12).

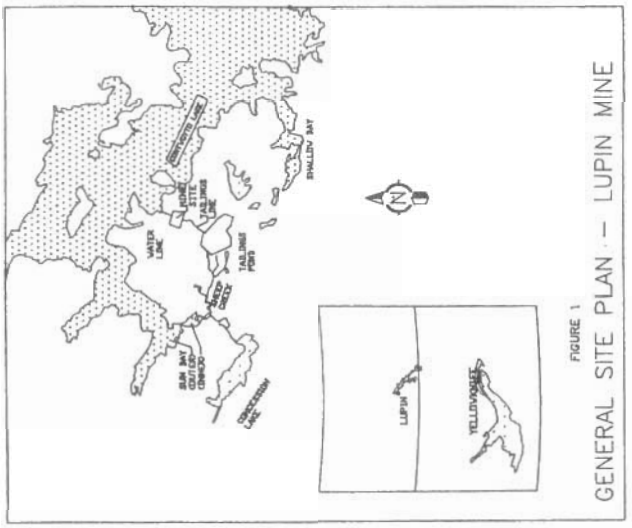
Mill tailings and effluent are pumped in slurry form through an 8 inch diameter insulated and heat-traced pipeline to the tails containment area (TCA) located approximately 6 kilometres southwest of the mine site. The TCA is contained within a lease of 750 hectares and presently covers an area of 361 hectare. Figure 11 shows the configuration of the TCA and how the configuration has changed since inception. The cells within the TCA allow for separation of the liquid from the solid tailings as well as providing initial treatment through natural degradation. A reduction of up to 90 percent (with regard to cyanide) in contaminant levels is achieved within the first stage of storage. Pond 1 receives water from the cells, retaining solutions for nearly eleven months prior to transfer/treatment into Pond 2. Treatment consists of the addition of ferric sulphate and lime for the removal of arsenic and metals and for pH adjustment.

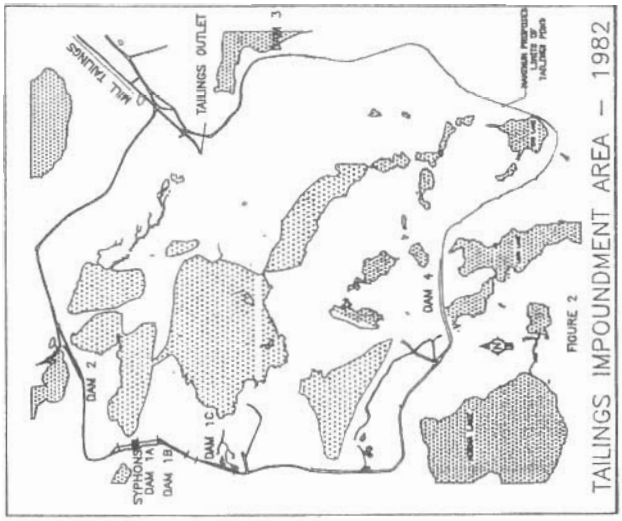
(FIGURE 11) Lupin Tailings Containment Area
(1982 - Present)

ECHO BAY MINES LTD.









Pond 2 then retains the water for approximately eleven months prior to discharge to the environment. Discharge to the environment is monitored and must meet the criteria outlined in Water Licence N7L2-0926.

Spill Response

Contingency plans for response to environmental spill occurrences at the Lupin site have been developed and initiated as required by Part F of Water Licence N7L2-0925. A condensed version of this plan can be found in the Environmental Spill section of the E.B.M.L - Lupin Operation Emergency Procedures manual. A copy of the plan in its entirety has been included in Appendix 13. The plan covers background information on the Lupin facilities and addresses response procedures in the event of malfunctions (leaks or seeps) associated with the tailings line, the TCA, the sewage system, paste backfill and minewater systems. It also addresses response procedures for spills of chemicals and petroleum products.

Final Reclamation

The Lupin mine site has an approved plan for final reclamation on mine closure. This plan is updated on an annual basis with the most recent submission being January, 1996 and titled Abandonment and Restoration Plan, Water Licence N7L2-0925. A copy of this plan is shown in Appendix 14. The plan discusses various abandonment strategies (short term, long term, final abandonment), the planned restoration activities associated with each and the disposition of the mine infrastructure components on final abandonment. Also included is a brief discussion on post closure monitoring.

3.1.2 Winter Road Operations: Yellowknife to Lupin

To accommodate the transport of fuel and other freight, a winter road has been constructed between Yellowknife to Lupin annually since 1983. The distance is 637 kilometres of which about 75 percent is over frozen lakes. Two maintenance camps, one located at Lockhart Lake and the other at Lac de Gras, serve as base camps for the road maintenance crews and rest stops for the truckers; a round trip takes about 36 hours. The winter road season is approximately 12 weeks long, from early January to mid March. Construction of the road takes about three weeks leaving about 9 weeks to move a years supply of freight and fuel up to the mine site. In 1996, almost 14 million kilograms of freight and over 22 million litres of fuel were transported to Lupin over the winter road. From 1989 to 1996, over 300,000 tons (250 million kilograms) of freight and over 172 million litres of fuel have been delivered.

Construction of the ice road sections of the winter road follow the ice thickness and safety guidelines presented in a manual provided by GNWT, A Field Guide to Ice Construction Safety.

To aid the safe transport of materials over the winter road, a policy and procedure manual was developed for use by the transport companies; EBM or contractors. This manual, the Highway and Winter Road Drivers' Policy and Procedures Manual, included in Appendix 15, identifies the procedures to be followed for transporting goods over the winter road. It identifies pre-trip, en route and post trip inspection requirements, ice road rules and regulations, procedures in case of breakdowns, reporting form requirements, the safety code of practise and those responsible for its administration. Each driver is issued a copy of the manual and must sign a sheet indicating they have read and understood all of the rules and regulations.

Spill Response

Due to the nature of much of the freight transported to Lupin, a contingency plan for oil and toxic materials spills has been developed for the winter road operation. This plan, the Transportation Emergency Response Plan, is included in Appendix 16. It describes the membership of the response team, reporting procedures, available equipment and action plans complete with material safety data sheets (MSDS) for the cleanup of various fuels, lubricants, and process chemicals and explosives used at the mine. Also included are guidelines for crisis media communications and maps and mileage charts for the road.

Two emergency response units are maintained and located along the winter road route. One unit is located at Lockhart Lake camp facility and the other at the Lac de Gras camp facility. Eleven winter road personnel are trained by Echo Bay Mines Ltd.-Lupin Safety Department to perform emergency response and recovery duties. Trained individuals are located at all pertinent facilities; Yellowknife, Lockhart Lake, Lac de Gras, Lupin and Edmonton.

3.1.3 Winter Road Operations: Lupin to Ulu

To accommodate exploration activity at the Ulu site, winter roads have been developed to provide access for equipment and materials from Lupin to Ulu. The first occurrence was in the winter of 1991-92 while the Ulu lease was under the ownership of BHP. EBM bought the lease from BHP in November, 1995 and immediately submitted land use applications to the Department of Indian Affairs and Northern Development (DIAND) and to the Kitikmeot Inuit Association (KIA) for permits to construct winter roads and quarries between Lupin and Ulu. Permit number N95E473 was issued by

DIAND on January 25, 1996 with expiry on January 25, 1998. Permit number I95F077 was issued by KIA on February 12, 1996 with expiry on December 31, 1996. Inspections of the winter road constructed were undertaken by officials of both DIAND and the KIA. Any deficiencies were corrected. Summer inspections of the road alignment indicated no reclamation repairs were necessary.

Spill contingency plans for this winter road follow those plans laid out for the Yellowknife to Lupin winter road in the document Transportation Emergency Response Plan. Spill cleanup materials are stored at Lupin and Ulu as well as at the temporary camps between the sites.

3.1.4 Monitoring and Research Programs

EBM has been involved in environmental research and monitoring programs at both a local and regional level. Locally, this involvement has been in the form of company run programs aimed at monitoring and reporting on water quality and volumes as related to domestic use and the operation of the tailings containment area and sewage ponds at Lupin. Fisheries investigations related to aquatic monitoring have been conducted in the Contwoyto Lake area since 1982. Programs using thermistors to monitor the permafrost depth in the tailings containment area dams and reclaimed areas have also being conducted since the early 1980's. EBM has willingly provided funding, data and editorial comments for programs such as the Mine Environment Neutral Drainage Program (MEND), Aquatic Effects Technology Evaluation Program (AETE), Assessment of the Aquatic Effects of Mining in Canada (AQUAMIN), the National Pollutant Release Inventory (NPRI) and the Accelerated Reduction/Elimination of Toxics (ARET).

EBM operates a weather station at Lupin that reports daily information to the Atmospheric Environment Service of Environment Canada. Water Survey of Canada has access to the fresh water supply pumphouse at Lupin in which a monitoring station has been installed.

At the regional level EBM has provided support, both financial and in-kind, to projects that further expand the knowledge of the environment in the central arctic. Funding to the West Kitikmeot-Slave Study has been provided. The provision of accommodation and transport to researchers working in the Lupin area (both government employees and government funded contractors) is common.

3.1.5 Lupin Licences and Permits

EBM holds various permits and licences associated with the Lupin minesite, Ulu exploration work, the Yellowknife to Lupin winter road and claims in the vicinity of Lupin.

The primary method for EBM to hold land is through Land Use Permits. EBM uses these permits to obtain access to areas for exploration work and for winter road right-of-way access. The following table summarizes the Land Use Permits that are currently held:

Table 4
Lupin Area Land Use Permits

Description	Permit Number	Issue Date	Expiry Date
Tailings spill area south of Lupin mill	N94X176	April 14, 1994	April 12, 1997
Winter road: Yellowknife to Lupin	N94F323	December 1, 1994	December 3, 1997
Exploration around Lupin (Crown Land)	N95C390	May 19, 1995	May 18, 1997
Exploration around Lupin (Nunavut)	I95C063	May 31, 1995	May 31, 1997
Dune (Nunavut)	I95C073	September 9, 1995	September 9, 1997
Winter road to Dune (Crown Land)	N95E460	November 27, 1995	November 26, 1997
Ulu exploration site use and Quarrying	I95C078	June 17, 1996	December 31, 1997
Lupin to Ulu winter road (Crown Land)	N95E473	January 26, 1996	January 25, 1998
Class C surveying permit (Nunavut)	I96C086	July 3, 1996	July 3, 1997
Ulu exploration (other)	I96C090	July 3, 1996	July 3, 1997
Lupin to Ulu winter road for 1997 (Nunavut)	Application submitted		
Lupin to Ulu winter road for 1997 (Crown Land)	N96E639	December 12, 1996	December 11, 1998

Associated with the Land Use Permits shown in Table 4 are Quarrying Permits allowing the use of sand and gravel taken from specific locations. Table 5 shows the list of Quarrying Permits presently held by EBM in the Lupin area.

Table 5
Lupin Area Quarrying Permits

Description	Permit Number	Issue Date	Expiry Date
Lupin to Ulu winter road (Crown Land) for 1996	95/113	December 19, 1995	December 18, 1996
Camp #2, Lupin to Ulu winter road (Crown Land)	96/08	February 2, 1996	February 1, 1997
Esker material for Ulu site (Nunavut)	I96C078	June 17, 1996	December 31, 1997
Lupin to Ulu winter road (Crown Land) for 1996	96/91	September 25, 1996	September 24, 1995

EBM holds several Surface Leases as shown in Table 6. Surface Leases allow access to land held within Mineral Leases. Lupin's main Surface Lease is # 3594; renewal of all other Surface Leases in the vicinity of Lupin or associated with the Lupin operation is dependant on #3594 being renewed first.

Table 6
Lupin Area Surface Leases

Description	Permit Number	Expiry Date	Date Renewal Requested
Lupin minesite, tailings area, sewage ponds, freshwater intake, winter road access	3594	March 31, 1996	March 6, 1995
Airstrip, weather station, helicopter pad, aircraft staging area, airstrip extension south	76E/14-2-9	March 31, 1996	March 9, 1995
Navigation aid	76E/14-10-2	March 31, 1996	March 9, 1995
Fingers Lake Quarry	76E/11-2-3	March 31, 1997	March 9, 1995
Fingers Lake Waterlogs	76E/11-3-3	March 31, 1997	March 27, 1995
Camp Lac de Gras (Yellowknife to Lupin winter road)	76D/8-1-2	March 31, 1996	March 9, 1995
Camp Lockhart (Yellowknife to Lupin winter road	85P/9-2-4	November 30, 1997	December 4, 1996

The primary method for EBM to hold land for exploration is with a Claim. A Claim allows some assurance that land cannot be taken over by another party without the

company's knowledge or approval. In the vicinity of Lupin the following claims are in good standing:

Table 7
Lupin Area Claims

Claim	Tenure Number	Claim Size (acres)	Expiry Date	Annual Cost ($)
PXD 1	F10648	2531	June 19, 2000	5061.70
PXD 2	F10649	826	June 19, 2000	1652.00
MUD 1	F19181	2582	June 25, 2001	5165.00
MUD 2	F19192	2582	June 25, 2001	5165.00
MUD 3	F19193	1085	June 25, 2001	2169.30
MUD 4	F19174	1808	June 25, 2001	3615.50
MUD 5	F19175	2479	June 25, 2001	4958.40
MUD 6	F19176	1859	June 25, 2001	3718.80
MUD 7	F19187	2582	June 25, 2001	5165.00
MUD 8	F19188	2066	June 25, 2001	4132.00
MUD 9	F19189	2066	June 25, 2001	4132.00
MUD 10	F19190	2582	June 25, 2001	5165.00
MUD 11	F19191	2582	June 25, 2001	5165.00
OP 41	F37600	154.95	March 25, 2000	309.90
OP 42	F37601	271.16	March 25, 2000	542.32
OP 43	F37602	268.45	March 25, 2000	536.90
OP 44	F37603	737.28	March 25, 2000	1474.76

After holding a Claim for ten years or after starting production on a Claim, a Mineral Lease must be obtained. Typically, a mineral lease is issued for twenty one years. Table 8 lists the Mineral Leases held by EBM in the Lupin area.

Table 8
Lupin Area Mineral Leases

Lease Number	Tenure Number	Lease Size (acres)	Expiry Date	Annual Cost ($)
3276	70272	2204	September 26, 2009	2204.00

Table 8 continued

Lease Number	Tenure Number	Lease Size (acres)	Expiry Date	Annual Cost ($)
3277	70272	2370	September 26, 2009	2370.00
3278	70272	2837	September 26, 2009	2837.00
2428	53168	6997	July 12, 2013	13994.00
3275	70272	2291	September 26, 2009	2291.00
3401	74849	1900	February 8, 2014	1900.00
3402	74849	2352	February 8, 2014	2352.00
3399	74851	2414	February 8, 2014	2414.00
3400	74850	1273	February 8, 2014	1273.00
3403	74851	2152	February 27, 2014	2152.00
3404	74851	1554	February 27, 2014	1554.00
3406	74849	2535	February 27, 2014	2535.00
3407	74850	2234	February 27, 2014	2234.00
3162	69158	1686	August 22, 2005	1686.00
3405	74850	2234	February 27, 2014	2234.00
3421	75428	378	February 2, 2014	378.00
3422	75429	96	February 2, 2014	95.60

One other instrument of tenure associated with the Lupin operation is the Licence of Occupation. Its authority falls between a Land Use Permit and a Surface Lease. It allows more flexibility to change than a Surface Lease but less than a Land Use Permit, and it gives more control and possession than a Land Use Permit but less than a Surface Lease. The main advantage of the Licence of Occupation for the Lupin operation is the protection of investment in the Yellowknife to Lupin winter road. Table 9 shows the details of the Licence of Occupation.

Table 9
Lupin Licence of Occupation

Licence Number	Annual Cost ($)	Expiry Date	Start Negotiations for a new Licence
75M/11-1-2	1230.50	April 30, 2000	April 30, 1997

Water Licence N7L2-0925 (see Appendix 12) entitles EBM to use water and dispose of waste from a mining and milling undertaking and associated uses at Lupin. The licence is subject to various conditions which describes the requirements that EBM must meet to stay in compliance. This "Type A" licence and was issued on June 1, 1995 and expires on May 31, 2000.