**Nunavut Water Board File No. NWB1LUP0008**

# NUNAVUT WATER BOARD

## DECISION

*Date of Hearing:* ***March 28 and 29, 2000***
*Date of Decision:* ***June 30, 2000***

**IN THE MATTER OF** Article 13 of the *Nunavut Land Claims Agreement,*

**- and -**

**IN THE MATTER OF** the renewal of Echo Bay Mines Limited's Lupin Mine industrial water licence.

*Cite as:* re: Lupin Licence Renewal 2000

**TABLE OF CONTENTS**

## APPEARANCES

| | |
|---|---|
| ECHO BAY MINES LIMITED (EBM) | Dave Hohnstein<br>Hugh Ducasse<br>Bill Danyluk<br>Jerry McCrank |
| DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS (DIAND) | Roxanne Beavers<br>Brian Collins |
| DEPARTMENT OF JUSTICE CANADA (DOJ) | Lee F. Webber |
| ENVIRONMENT CANADA (EC) | Anne Wilson |
| CITIZENS | Moses Koihuk<br>John Lyall |
| BRODIE CONSULTING LTD. (BCL) | John Brodie |

**SUMMARY**

On July 12, 1999, the Nunavut Water Board received an application for the renewal of licence N7L2-0925 from Echo Bay Mines Limited. Following screening of the application by the Nunavut Impact Review Board (NIRB), the Board decided to hold a hearing on March 28 and 29, 2000 before approving the application. After reviewing submissions from several parties, including Echo Bay Mines Limited, Department of Indian and Northern Development, Environment Canada/Department of Fisheries and Oceans, and Mr. John Brodie, the Board decided to renew Echo Bay Limited's water licence for a term of eight years. The Nunavut Water Board attaches several conditions, including provision for a security deposit of $29.2 million with annual adjustments based on a periodic assessment of liability, the use of 1.7 million cubic meters of water for industrial purposes from Contwoyto Lake, additional sampling requirements under the Surveillance Network Program, annual geotechnical inspection of all dam and dyke structures, the submission of a comprehensive Tailings Management Report, and the submission of a final abandonment and restoration plan at least three years before final closure.

## I. PROCEDURAL HISTORY AND BACKGROUND

Procedural History

This matter involves the renewal of the water licence N7L2-0925 for Echo Bay Mines Limited's Lupin Mine. This licence authorizes Echo Bay Mines Limited (EBM) to use water and dispose of waste in conjunction with their mining operation. The Lupin Mine site is located on Crown Lands within the Burnside watershed in the Kitikmeot region of Nunavut at longitude 111°14' W and latitude 65°46' N.

The initial water licence was issued by the Northwest Territories Water Board on June 1, 1981 and expired on May 31, 1987. Two amendments were approved by the Northwest Territories Water Board during the term of the first licence:

1) Amendment No.1 modified waste disposal conditions to allow and set discharge limits for the disposal of sewage wastes separately from the tailings discharge;

2) Amendment No. 2 followed a public hearing and was approved to allow discharge of mine water to the Sewage Lakes system subject to specified criteria, and the licence was extended to May 31, 1990.

The water licenses were renewed in 1990 and 1995. The most significant amendment was made to the licence in 1994 to allow EBM to use paste backfill technology to return a portion of tailings underground. The 1995 licence was issued pursuant to the *Northwest Territories Waters Act* and Regulations and was due to expire on May 31, 2000. No modifications or amendments to the licence were made during this term. The only significant operating change occurred in January 1998 when Lupin entered into a care and maintenance phase due to the decline of world gold prices. EBM notified the Board of resumption of operation on March 28, 2000. As with previous licences, this licence authorizes EBM to use water and dispose of waste in conjunction with mining and milling.

On July 12, 1999, the Board received an application for licence renewal from EBM. In accordance with Articles 12 of the *Agreement Between the Inuit of the Nunavut Settlement Area and her Majesty the queen in Right of Canada* (NLCA), the project was screened by the Nunavut Impact Review Board (NIRB) to determine whether it had significant impact potential and whether it required review prior to processing by the Nunavut Water Board (NWB). The

NIRB Screening Decision[1] indicated that the project proposal could be processed without a review under Part 5 or 6 of Article 12 of the NLCA. Following receipt of the decision and a cursory review of the application under Article 13 of the NLCA, the Nunavut Water Board decided to hold a hearing before approving it. Notice of the public hearing was given on December 17, 1999. Prior to the public hearing, pre-hearings[2] were held on January 25 and 26, 2000 to inform the public about the project and the process to be followed by the Board.

A public hearing was held in Kugluktuk on March 28, 2000. In light of issues raised at the hearing, the Board gave all parties the opportunity to respond or comment[3] on specific issues related to the application. A deadline to receive submissions was set for April 14, 2000[4] and a deadline to reply to written submissions received during the two-week period was set for April 21, 2000[5]. At the request of the DIAND, Department of Sustainable Development (DSD) and EBM, the Board decided to extend the final deadline for submissions to April 25, 2000. The Board granted a one-month extension to EBM until June 30, 2000 in order to complete its decision on the renewal of the licence.

---

[1] Screening Decision of the Nunavut Impact Review Board (NIRB) on Application: NIRB 99WR053 dated November 16, 1999. The decision of the [NIRB] Board in this case is 12.4.4 (a) the proposal may be processed without a review under Part 5 or 6 [of Article 12 of the NLCA]; NIRB may recommend specific terms and conditions to be attached to any approval, reflecting the primary objectives set out in Section 12.2.5. The screening decision outlines the following: authority of the NIRB; primary objectives; reasons for decision; terms and conditions with respect to waste & water management, mining operations, quarrying, structure/storage facilities, fuel and chemical storage, wildlife, environmental, archaeological sites, reclamation, monitoring, and other recommendation; and the validity of the NLCA.

[2] Notice of Pre-hearing was given in English and Inuinaktun, to local, territorial and federal government agencies on January 10, 2000. Pre-hearing meetings were held in Umingmaktok, Bathurst Inlet and Kuglugtuk on January 25, 2000 and in Cambridge Bay on January 26, 2000.

[3] At the end of the Kugluktuk hearing, the Board established time periods for replies to 2 documents:

1. Mr. John Brodie's report on the Abandonment and Reclamation Cost Estimate of the Lupin Mine; and
2. Echo Bay Mines Limited's document setting forth comments on the interventions regarding Lupin and Ulu applications.

[4] The following submissions were received on April 14, 2000:

1. Echo Bay Mines: Response to Brodie's Cost Estimate;
2. Echo Bay Mines: Reclamation Security;
3. Environment Canada: Response to Echo Bay's comments;
4. DIAND: Response to Echo Bay's comments and Brodie's Review; and
5. Department of Sustainable Development (DSD): Comments on Echo Bay mines Public Review.

[5] The Board decided that the reply opportunity was available only to those who submitted written submissions during the two-week period. Comments were received from DIAND, Department of Justice-Lee Webber, and Echo Bay Mines Limited.

Background[6]

EBM is one of the largest producers of gold and silver in North America. In 1995, the company produced more than 750,000 ounces of gold and 11 million ounces of silver from four mines, three located in the USA and one, the Lupin Mine, in Nunavut. The history of EBM in Canada's North began in 1964 at Port Radium, on the shores of Great Bear Lake about 41 kilometers south of the Arctic Circle. After 19 years of mining, reclamation was initiated in 1982 and completed by 1985.[7]

EBM obtained an option for the Lupin property from Inco in 1979 and proceeded with an underground exploration program. In 1980, the decision was made to proceed with development and construction of the Lupin Mine. In 15 years of commercial production, 2.8 million ounces of gold was extracted. Proven and probable ore reserves are currently estimated at two million tons, containing approximately 543,000 ounces of gold.[8]

The Lupin Mine site is located on the western shore of Contwoyto Lake, Nunavut, approximately 285 kilometers southeast of the community of Kugluktuk, 80 kilometers south of the Arctic Circle and 400 kilometers northeast of the City of Yellowknife, Northwest Territories.

The site is currently accessible year round by aircraft and seasonally by winter road, and is in treeless arctic tundra. The climate is severe with winter and summer temperatures typically ranging from –50º Celsius to +30º Celsius. Permafrost in this area typically persists to depths of several hundred meters.

The gold deposit lies in an amphibolite vein structure containing variable amounts of gold-bearing sulphides. The geological structure in the vicinity of the mine site has been titled and folded resulting in a deposit, which consists of three steeply dipping links that are referred to as the east zone, center zone and west zone.[9]

[6] All background information taken from "Echo Bay Mines Limited Environmental Assessment Ulu Project" dated January 1997 or the original application for licence renewal filed by Echo Bay Mines Limited on July 12, 1999.
[7] Exhibit # 5 shows reclamation completed at the Port Radium site and other Echo Bay Mines Limited properties.
[8] A submission in Support of the Licence Renewal Application prepared by Echo Bay Mines Limited, dated July 5, 1999.
[9] "Initial Environmental Evaluation for the Lupin Gold Project", prepared for Echo Bay Mines Limited by Beak Consultants Limited and Mary Collins Consultants Limited. January 1980.

## II. ISSUES

At the public hearing, several parties raised a number of related issues regarding the water licence for EBM's Lupin Mine. These issues include:

A. The assessment of the overall cost of reclamation or abandonment and restoration of the Lupin Mine and total amount of security required of EBM, including the form and schedule of payment;
B. Water use and Conservation;
C. Modification to Regulated Discharge Parameters and SNP;
D. Tailings Containment Area (TCA);
E. Dam and Dyke Stability
F. Previous Tailings Spills;
G. Acid Rock Drainage (ARD);
H. Abandonment and Restoration (A & R) Plan; and,
I. Term of licence.

## III. SUMMARY OF EVIDENCE

### A. Echo Bay Mines Limited

General

At the hearing and in the initial submission[10], EBM provided a historical summary of the project, and overviewed the operation including existing water use and waste disposal facilities.

EBM requested an eight-year licence, with a expiry date of May 31, 2008, to correspond with a recent "Re-engineering Study" and mine plan development based on current mine life, ore reserves and projected resource development.[11]

[10] Application form; letter dated July 5, 1999 by David Hohnstein, and "A submission in support of the Licence Renewal application for Lupin Mine Contwoyto Lake, Water Licence N7L2-0925 prepared for the Nunavut Water Board by Echo Bay Mines Limited, Lupin operations, NT." Dated July 5, 1999.

[11] While in Care and Maintenance phase, an intensive in-house re-engineering study was carried out in 1998 which identified a number of operational changes which could be invoked to reopen the Lupin mine. The plan indicates steady production for a five-year period followed by three years of declining production.

Security

In their submission, EBM was of the opinion that the amount currently set, as security is reasonable and should be maintained, in light of their excellent compliance history and their demonstration of progressive reclamation[12]

In support of the application, EBM submitted two closure cost estimates[13]: an independent estimate of closure cost, including indirect costs for major components, prepared for EBM by Golder and Associates, which totaled $29,346,000, and EBM's revised estimate of Golder's at $18,900,000.

According to EBM's submission of April 12, 2000, the Golder closure cost estimate should be reduced as follows:

i. Cost Reduction of $3,988,696 because covering of Cell 4 of the TCA is not required;

ii. Cost reduction of $3,129,126 from re-calculation of labor costs based on an overtime averaging permit;

iii. Cost reduction of $1, 239,823 due to the fact that only 1.75 meters of esker cover material for reclamation of exposed tailings is sufficient as opposed to 2 meters assumed by Golder;

iv. Cost reduction of $1,553,282 in general expenses in light of changes to reclamation implementation expectations.

This amounts to a total cost reduction of $9,911,000 from the Golder assessment. Additionally, in light of progressive reclamation work completed to date, EBM suggests that an additional reduction of $144,000 should be applied[14]. Taking all the above factors into account, EBM told the Board that the Golder estimate should be reduced by $10,055,000, for a total of $19,291,000.

During the hearing and in the first round of submission following the hearing, EBM was concerned that Brodie[15] used Golder's 'upper bound' estimate of $29,400,000 instead of their recalculated estimate of $18,900,000 as the

[12] See Echo Bay Mines Limited's Licence Renewal submission to the Nunavut Water Board, July 5, 1999.
[13] Submission dated December 1997. "Report on Closure Cost Estimate and Scoping of Mine Closure Issues, Lupin Mine, NWT" Golder Associates Limited, Alberta, and Submission dated December 11, 199, "Review of Lupin Closure Cost Estimate", Mike Tansey, Echo Bay Mines Limited.
[14] April 14, 1999 submission by EBM.
[15] Brodie Consulting Ltd., submission re: Lupin Mine-Review of A&R plan and reclamation cost estimate, dated March 20, 2000.

basis for his assessment. EBM believed that the following cost reduction should be applied to Brodie's estimate of $44,608,140.

i. EBM argued that the inflation adjustment to the Golder estimate should be based on actual and historical rates, and that $2,511,935 should be deducted from the Brodie estimate.

ii. Based on EBM cost history for winter road construction and operation, EBM calculated that a reduction of $4,538,000 should be applied to the Brodie estimate.

iii. Based on volume of fuel required on site and actual delivery costs, EBM calculated that the Brodie estimate should be reduced by $623,785.

Taking the above arguments into account, EBM was of the opinion that the Brodie estimate should be reduced to $36,934,420. However, EBM urged the Board to use their assessment of $18.9 million since in their opinion, their calculation was based on their actual costs since they intended to abandon and restore the mine themselves.

At the hearing, EBM proposed the establishment of a reclamation trust fund as allowed in the previous Lupin water licence, and further recommended that the security required under that licence be rolled over into the fund so that interest could be accrued[16]. The establishment of a reclamation trust fund (RTF) would require EBM to set aside funds as gold is produced. EBM stated that "this approach, funding on a graduated basis, does not burden the company with having to set aside all funds five to six years in advance of the actual closure spending [and] the NWB [would] have tangible assurance of money being set aside and invested to grow for the future."[17] Echo Bay proposed to DIAND that US $45 per ounce of gold produced and sold from

[16] Licence N7L2-0925 required security to be provided according to the following:

Part B: General Conditions

Item 2. The Licensee shall have posted and shall maintain a security deposit in the amount of One Million ($1,000,000.00) Dollars pursuant to Section 17(1) of the Act and Section 12 of the regulations. The security deposit shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to Section 17 of the Act. This clause shall survive the expiry of this Licence or renewals thereof.

Item 3. A Reclamation Trust Fund may be established during the term of this Licence. The Licensee shall implement the terms of the Trust Agreement as approved by the Board.

[17] Letter dated April12, 2000. "Re: Reclamation Surety & Liability" Bill Danyluk, Mine Manager, Lupin Operations.

Lupin would be the basis for a trust fund,[18] that the current security held under the previous water licence would be added to the fund, and confirmed that debits would not be made to the fund. At the planned production rates, EBM estimated that the company would contribute approximately CDN $1,100,000 to the fund each year.

Additionally, in response to DIAND's submission, EBM suggested that only areas that have been disturbed should be included in the estimate, but not unused areas of potential use, and disagreed with the inclusion of Cell 4, currently undisturbed, in the estimate.

Water Use

In its application, EBM asked the Board to maintain the annual water use rate at 1.7 million cubic meters. EBM pointed out that there was a slight increase in water use in 1995 due to the operation of the paste backfill system and confirmed that better control and recycling of water within the mill circuit would keep water use below the requested amount.

EBM told the Board that it will continue to monitor the use of water and review the use on a regular basis to improve recycling within the process and conserve water. EBM further stated that "one major addition to the milling process was the introduction of process control instrumentation (1986-1987) ....[to help] not only in the area of chemical addition but in controlling water volumes being used in various areas of the mill. Water recycling within the milling and recovery process is optimized with the use of this instrumentation. Reducing the volume of freshwater used is a common goal as it also reduces the amount of water requiring treatment at the TCA. This is an ongoing process and will continue once the processes are fully operational in 2000."[19]

Surveillance Network Program (SNP)

With respect to the current SNP, EBM asked the Board to remove requirements for sampling/analysis of parameters which are not regulated as part of the effluent quality limits, and that limits be adjusted and harmonized.

Several parties asked the Board to make the following changes to the SNP:

i. Sampling to assess nutrient loading along discharge paths from the decant structure from the Sewage Lake disposal system at SNP Station 925-14;

[18] March 26, 2000 submission by EBM, page 11 of 14: at the hearing, EBM indicated that discussions have already been held with DIAND regarding appropriate security for the land leases held by the company.
[19] Exhibit #2.

ii. New SNP Station established in the receiving bay of Contwoyto Lake;

iii. Toxicity testing to assess discharge from the TCA;

iv. Sampling for Oil and Grease at SNP Station 925-14;

v. Additional sampling for Total Cadmium, alkalinity, hardness, and ammonia at SNP Station 925-10, 12, 20, 21, 22, 24, and 25;

vi. Reinstatement of SNP Station 925-15; and

vii. ICP-MS[20] for 24 total metals at SNP Station 925-10 and 15.

To these recommendations, EBM responded as follows:

i. Nutrients: EBM stated in their written submission and at the hearing that nutrient data had been collected in the past and could be provided to the Board. Earlier results indicated minimal phosphorus (detection limits) and low levels of nitrogen and ammonia in the TCA effluent. EBM also indicated that while phosphorus may not have been monitored in the past for the sewage effluent, the effluent flows through a significant wetland prior to entering Contwoyto Lake, and this environmental buffer would have some beneficial effects on effluent quality.

   EBM questioned the relevancy of monitoring nutrients loading of sewage from the mine's 200-man camp when more than 100,000 caribou migrate through the area and may add more nutrient to the waters of Contwoyto Lake than sewage effluent does.

ii. New SNP Station: EBM indicated that there is a historical station in the bay to the east of Lupin that was used in conjunction with sewage effluent monitoring. Additionally, EBM indicated that in light of the limited time frame to collect samples during open water and relatively low volume of water released, the expected low nutrient levels and the size of the receiving water body, it might be difficult to assess levels reaching Contwoyto Lake.

iii. Toxicity Testing: EBM told the Board that the company has been proactive in conducting bioassay tests from the time of initial discharge of TCA waters in 1985. Additionally, EBM said that historical data show that water quality does not change significantly over the period of discharge and disagreed with the need for bioassay testing at initiation and termination of decant.

[20] Inductively Coupled Plasma Spectrometry Scan

iv. Oil and Grease: EBM said that once start up of the mill is completed, a method of directing the mine water to the TCA would be investigated, thereby reducing the overall volume, as well as the likelihood of oil/ fuels from the underground entering the sewage lakes system.

v. Additional Parameters to SNP: EBM said that all parameters would be at or near detection limits or too low to be accurately measured. EBM indicated that alkalinity and hardness are not normally present in the natural waters of the area and the input volumes from the TCA influence these parameters in direct response to the mixing zone and dilution.

vi. Reinstatement of SNP 925-15: EBM told the Board that in the past, monitoring of water being transferred from Pond No. 1 to Pond No. 2 had been done to assess treatment efficiency of the chemical addition process when treating for elevated levels of arsenic. Special handling and processing of the sample is undertaken by EBM to ensure an accurate account of the treated water quality entering Pond No. 2. Monitoring pH could also be misleading given that lime is added on the downstream side of the siphons and may not be completely dissolved when a sample is obtained. EBM told the Board that continued in-house monitoring was preferred, with samples taken only at the time of transfer to Pond No.2, and ultimately believed that the process within the TCA was an operational concern rather than a regulatory one.

vii. ICP-MS for 24 Metals:
EBM disagreed[21] with the recommendation to perform an ICP-MS for 24 metals at SNP-15 because transfer of water from Pond 1 to Pond 2 is an internal process that is part of the overall management of the TCA.

After being questioned by EBM[22] on this issue, Environment Canada (EC) agreed that the operations within the TCA is part of the internal operations of the mine treatment system, and that it did not need to know the information as long as limits were being met at the last point of discharge from the TCA.

Regulated Discharge Parameters

In response to EC's recommendation that the regulated discharge parameters for sewage effluent and effluent from the TCA be combined, EBM said at the hearing that the mine was in fact meeting the limits set in the licence. EBM said that the company's ability to achieve low limits is due to improved management of the tailing facility.

[21] Exhibit # 2
[22] Transcript p. 32

EBM requested clarification from EC as to whether or not the proposed parameters are standard throughout the industry and whether or not the mine may be penalized for doing an excellent job in management of the tailing facility. EBM conceded that combining the limits was 'good thinking' but argued that there was no rationale given for lowering the lead limit for the TCA or lowering the limit of Total Suspended Solids (TSS) for the sewage discharge, for example. EBM stated that TSS can fluctuate considerably depending upon the state of health of the sewage ponds and whether there are any natural biological releases (e.g. Daphnia, algae). In conclusion, EBM said that there was no valid reason to standardize licence limits for the two types of effluent discharge.

Acid Rock Drainage (ARD)

In the identification of potentially acid generating waste rock, EBM indicated that very little if any waste rock is brought to the surface for future use but agreed that sampling and assessment of waste rock could be completed on major uses.

Abandonment and Restoration (A & R)

i. Cover Assessment: With respect to using coarse kimberlite as tailing cover, EBM confirmed that minor amounts were disposed of in Cell No. 2, and not necessarily as cover but for disposal. EBM said that it plans to use esker material for final cover regardless of whether kimberlite processing becomes a reality. EBM conceded that if coarse kimberlite were to be used as an additional source of cover material, this option would be investigated prior to any placement for closure.

ii. Final A & R Plan: EBM agreed with EC/DFO and DIAND that a Final A & R Plan will be required prior to closure and suggested that assessment of surface contamination could be included within this plan.

iii. Monitoring: Regarding tailings dam geotechnical monitoring, EBM confirmed that thermistors in Pond No. 2 have been non-operational for several years. EBM pointed out that their focus has been on the reclamation thermistors.

iv. Repair of Thermistors: EBM agreed with DIAND that newer thermistors should be placed in strategic locations to monitor the temperature within the dams and foundations; however, EBM considered that this issue was an operational concern that should be addressed in the context of preparation of its A & R Plan. EBM told the Board that the company monitors thermistors (i.e., TC1-4 and TC1-5) bi-weekly or

weekly to obtain accurate data on warming and cooling peaks, and therefore disagreed with DIAND about the need for monthly monitoring.

v. Tailings Disposal Management: Both EC and DIAND requested additional information on tailings pond capacity. EBM considers the information an operational aspect of the TCA.[23]

EBM agreed with DIAND's recommendation that tailings compatibility studies are a necessity not only for closure planning but to ensure that performance of the TCA in regards to water quality is maintained.

## B. Environment Canada (EC) and Department of Fisheries and Oceans (DFO)

General

EC/DFO made an initial joint submission to the NWB on March 17, 2000. In its initial submission, EC/DFO describes concerns and recommendations regarding: water use amounts, modification to the SNP, standardization of effluent limits for effluent discharges, acid rock drainage, areas of surface contamination, revision of the A & R Plan, tailings containment capacity and stability, summarization of the 1992 tailings spill monitoring data, licence term, and security deposit.

Water Use

EC/DFO recommended that the current water usage level be maintained, and that EBM continue to strive to reduce water usage through improved conservation and recycling practices.

Surveillance Network Program (SNP)
EC/DFO recommended amendments to the SNP and/or regulated parameters as follows:

i. Nutrients: EC/DFO recommended the addition of total phosphorus, nitrogen and ammonia for the Sewage Lakes Discharge, and of ammonia to the TCA discharge, to be measured weekly.

EC supported EBM's suggestion that a collaborative study with DFO might be a good idea. EC indicated that it can provide laboratory support for the measurements of nutrients and would be interested in jointly conducting preliminary studies on the receiving bay of Contwoyto Lake during the open water season.

[23] Exhibit # 2, p. 14. Surveys of both Cell 3 and 5 were completed and reviewed in 1999 by EBM.

ii. New SNP station: EC recommends establishment of an additional SNP station in the receiving bay of Contwoyto Lake to assess nutrient levels reaching the lake, with monthly sampling during open water.

When questioned by EBM, EC replied that the proposed SNP station should be located at the inflow of the stream from the Sewage Lakes, and that reinstating a historical station in the vicinity would be appropriate.

iii. Toxicity Testing: EC recommended toxicity testing of discharge from the TCA at initiation and termination of decant to assess impacts on downstream fish resources, using rainbow trout and *Daphnia magna* bioassay tests.

EC submission of April 14, 2000 stated that EC could offer assistance to EBM by providing pass/fail bioassay testing of the effluent.

iv. Oil and Grease: EC/DFO recommended the addition of oil and grease as regulated parameter, as well as to the SNP for weekly measurement at Station 925-14 because of the potential for discharge of lubricants and fuel residues in minewater, and for oils in camp wastes.

v. Additional Parameters to SNP: EC/DFO recommended the addition of ammonia at SNP Station 925-10 (final discharges from the TCA) for weekly monitoring under the SNP.

Combining Regulated Parameters

EC/DFO noted that the mine releases effluent from two separate waste streams[24], and recommended that the regulated licence limits of both sources be combined and adjusted to the lowest limit where applicable.

Acid Rock Drainage

In preparation for proper closure, EC/DFO recommended that EBM be required to compile data collected to date on ARD potential for tailings, ore and waste rock, to identify all sites potentially acid generating, to prepare plans for testing of construction rock, and for prevention of tailings acid generation. EC/DFO also asked EBM to demonstrate that granular cover is effective in inducing permafrost formation and preventing the release of acid

[24] The TCA, which releases treated effluent into Seep Creek and ultimately Sun Bay of Contwoyto Lake, and the Sewage Lakes discharge, which releases treated sewage effluent and mine water into a receiving stream which drains into an unnamed bay of Contwoyto Lake.

drainage from the tailings, and to evaluate the coarse kimberlite tailings cover in areas of the TCA where it has been used as a cover material.

Abandonment and Restoration
EC/DFO recommended that the A &R plan submitted and approved in 1996 be revised within the next 12 months and modified to reflect changes in operation and technology as well as EC comments on that draft provided in March 1998.

Tailings Dams Geotechnical Monitoring: EC/DFO noted that the 1999 geotechnical inspection indicated a lack of thermistors and recommended the installation of thermistors in Dam 1A and 2 to detect thawing of dam foundations.

Tailings Pond Capacity: EC/DFO recommended that EBM provide a rationale for the selection of options to be used to increase capacity beyond the currently estimated 5.1 years available. EC/DFO also encouraged the selection of options that avoid the use of End Lake so as to keep the footprint to the minimum possible within the TCA. EC/DFO finally asked that surveys be done to confirm the current capacity levels, notably for Cells 3 and 5, over the next ice-free season.

Compilation of 1992 Spill Data: EC/DFO requested a summary and interpretation of data collected on the 1992 Spill from the TCA, and EMB agreed to the request at the hearing.

Licence Term

EC/DFO recommended that the licence term be no more than 5 years so that any evaluation needed (such as tailings chemistry and behaviour) can be identified and/or done prior to issuance of the closure phase licence.

Security

EC/DFO recommended that security requested by the Board should match the actual reclamation liability amount of water related components of abandonment and restoration of the site, which according to EC/DFO have been estimated between $12.6 and $21.1 million. Additionally, EC/DFO recommended including annual review, and provisions for credit or refunds to be granted back for progressive reclamation work completed.

EC first round submission[25] supported the idea of a reclamation trust fund and agreed with EBM that duplication of security requirement for land and water should be avoided.

[25] Letter dated April 14, 2000 by Anne Wilson.

## C. Department of Indian Affairs and Northern Development (DIAND)

General

DIAND recommended that the Board renew the licence for a 5-year term but agreed that if the Board decided to renew the licence for an 8-year term, the licence should contain requirements for submission of a final A & R plan at least three years prior to mine closure.[26]

DIAND recommended that the licence reflect current industrial licence conditions and that full definitions for the following terms be included in the new licence: Acid/Alkaline Rock Drainage (ARD), Freeboard, Geotechnical Engineer, and Progressive Reclamation.[27]

DIAND further recommended that the licence contain precise language with respect to the powers of inspectors to reflect the actual provisions of the *Northwest Territories Waters Act* (Act).[28]

Water Use

DIAND recommended that the licensed volume of freshwater remain at 1,700,000 cubic meters, and that the Licensee be required to submit a Water Conservation Plan to reduce fresh water requirements and decant volumes.

Surveillance Network Program (SNP)

DIAND recommended the following amendments to the SNP protocols which monitor the decant from the sewage lake and the TCA:

a. Additional Parameters to SNP: Add monitoring for Total Cadmium, Alkalinity, Hardness, and Ammonia at SNP Stations 925-10,14,21,22,24, and 25 at same frequency as in 1995 licence SNP, to assess the impact on the surrounding environment of discharge from the TCA or the Sewage Lakes system.

---

[26] According to DIAND's hearing submission, the Final A & R Plan should include:

1. an outline of methods to contain potential pore water expulsion from the TCA;
2. identification of sites of contaminated soils at the minesite;
3. identification of regions with appropriate esker material for TCA cover, and the amount needed to cover cells;
4. a summary of existing data for background levels of metals in the area, and identification of needs for verification of data or reassessment with modern detection limits.

[27] Following the public hearing, DIAND provided sample definitions for the Board's consideration.

[28] It is DIAND's understanding that by virtue of the *Nunavut Act,* the relevant provisions of the *Northwest Territories Waters Act* continue to apply, but the point of inspection is not spoken of in legislation specifically and explicitly with respect to Nunavut.

b. Nutrients: Add monitoring of nutrients (Total Phosphorus, Orthophosphorus, Total Nitrogen, Nitrate and Nitrite) at SNP Station 925-14 to be sampled on the first day of discharge and monthly thereafter during periods of flow;

c. Reinstatement of SNP 925-15: Measure Total Arsenic, Total Copper, Total Nickel, Total Lead, Total Suspended Solids, pH, Total Cadmium, Alkalinity, Hardness and Ammonia to be sampled on the first day of discharge and weekly thereafter during periods of flow to assess performance of the two pond tailings system and to address the variability of oxidation rates and loads of oxidation produced at different location within the TCA.

d. ICP-MS for 24 Metals: Add ICP-MS Scan of 24 Total metals at SNP Station 925-10 to be sampled on the first day of discharge and monthly thereafter during periods of flow and at SNP Station 925-15 on the first day of discharge to assist in interpreting the results obtained at the decant SNP Station.

Tailings Containment Area (TCA)

DIAND recommended to the Board that EBM be required to produce a tailings capacity report, updated annually. DIAND asked that the report examine remaining capacity in the TCA compared with remaining Lupin reserves and additional ores to be processed at Lupin, and include plans for future modifications of the TCA.

The Department also recommended that the Board require EBM to perform tailings compatibility studies for any additional ores they are planning to process at Lupin. In addition, the operation and closure plans for the TCA should be reassessed should any tailings from different sites be proposed for addition to the TCA.

DIAND also recommended that EBM be required to repair broken thermistors in Dam 1a and 2.

Abandonment and Restoration (A & R)

1. Acid Rock Drainage (ARD)

DIAND acknowledges that EBM has been progressive in its studies used to characterize ARD on site, but identified areas where additional work is required, including: waste rock, exposed tailing, underground workings and closure planning for the TCA.

DIAND specifically recommended the following:

a. That the Board require a survey of the Acid Base Accounting (ABA) characteristics of waste rock used around the site in the construction of roads, airstrips, buildings foundations, crown pillar backfill, pads and dams. As well, DIAND recommended that waste rock proposed for use in future construction be sampled on a regular basis, and only non-potentially acid-generating and low soluble metal material be used. A review of kinetic test data should be used to set site specific criteria for selection of construction rock.

b. That EBM be directed to sample currently exposed tailings surfaces to track oxidation rates and developing loads of oxidation products within the TCA. Analyses might include field rinse pH, conductivity profiles, and ABA and metal extraction tests on a modest number of samples from the TCA.

c. That EBM, as part of their reopening, monitor mine water to gauge the extent of contaminant release underground, and that when the mine is closer to abandonment of the underground workings, it be directed to conduct a survey of underground walls (wall wash studies) to assess the potential release of contaminants to the water column when the mine floods at closure.

d. That the Board require EBM to study the potential interaction between covered cells and flooded areas of the TCA, and include thermal analyses and modeling of the interaction between the ponds, the frozen-core perimeter dykes, and frozen tailings within cells, and address the thermal effects of proposed pond elevations.

2. Progressive Reclamation of the TCA

DIAND acknowledged that EBM began progressive reclamation of the TCA.

DIAND recommended that EBM replace two broken thermistors and add thermistors in at least three more areas: in the center of Cell1, adjacent to Dam 3D which borders Pond 1, and at the point where tailings depth is estimated to be greatest. Monitoring should continue to examine the potential for ground warming trends and provide valuable data to assess depth of cover required for final closure. Monitoring of thermistor data should be undertaken monthly and reported to the Board annually.

In its additional submission of April 14, 2000, DIAND recommended that a map and depth assessment of current thermistors and future data could be included in the long-term study proposed for Cell 1.

DIAND also recommended that EBM be required to conduct a long-term study[29] on permafrost aggradation and pore water pressure in Cell 1. The study should include the following:

- Continued measurement of ground temperatures;
- General stratigraphy of Cell 1;
- Measurement of surface uplift of Cell 1;
- Measurement of pore water pressure in the tailings;
- Sampling and testing the solute concentration of unfrozen pore water; and
- Electromagnetic surveys to determine ground conductivity.

DIAND argued that while data from six thermistors extending to a depth of 13 meters indicated frozen conditions in Cell 1, the potential existed for excess pore water pressure to develop within the tailings, which could lead to rupture of the overburden in the TCA.[30]

On the issue of the thickness of esker material required to cover tailings in order to maintain them permanently frozen, DIAND argued that additional work should be done to demonstrate that tailings can be completely frozen with a cover thickness of 1.75m.

3. Final Abandonment and Reclamation (A & R) Plan

DIAND recommended that EBM submit their final A & R plan not less than three years prior to the end of mine life. The plan should incorporate suggestions contained in the report on "Closure Cost Estimate and Scoping of Mine Closure Issues, Lupin Mine NWT".[31] The plan should also include:

- An outline of methods to contain potential pore water expulsion from the TCA;
- Identification of sites of contaminated soils at the mine site;
- Identification of regions with appropriate esker material for TCA cover and the amount needed to cover cells;

[29] DIAND indicated in their submission dated April 14, 2000 that Dr. Chris Burns, Professor of Geography, and Peril Mewling, professional engineer, as experts advised DIAND on technical issues related to the recommendation of this study.

[30] In its submission of April 14, 2000, DIAND stated "liquid water exists in many soil-water systems, even when the temperature is well below the initial freezing point. As permafrost aggrades into the tailings, unfrozen pore water becomes enriched with solutes, which depresses the freezing point. The unfrozen pore water, contained by permafrost, would be under pressure, which could lead to rupture of the overlying permafrost and breach the impermeable cover of this tailings cell. Any rupture of the cover material would influence both temperature of the tailings cell and the potential for oxidation of the tailings."

[31] Submitted with the application. (Golder Associates, 1997)

- A summary of existing data for background levels of metals in the area, and identification of needs for verification of data or reassessment with modern detection limits;
- Description of restoration activities outlined in the interim plan;
- An implementation schedule for the completion of restoration; and,
- A detailed monitoring program.

DIAND further recommends that the final plan be subject to annual review to reflect changes in technology and operations.

Security

At the public hearing, DIAND confirmed that they are more than satisfied with the company's level of compliance with its licence and recognizes the company's proactive approach to environmental management.

DIAND's position on mine site reclamation is that mining companies must have sufficient financial assurances in place so that costs for mine site clean-up do not become the responsibility of the Crown.

DIAND also referred to its Mine Reclamation Policy Discussion Paper for the Northwest Territories and indicated that it provided further guidance on the need for all mining companies to provide the Crown with financial assurance to cover actual costs of abandonment and restoration.[32] DIAND therefore recommended that the Board require security based on an estimate that incorporated the following assumptions:

i. Cell 4 has been used to store tailing solids and requires cover;

ii. Esker cover over tailings solids for closure purposes is 1.75 m in thickness; and,

iii. All work is based on independent contractor rates.

DIAND noted in their initial submission that the Golder unit costs appeared to "reasonably reflect anticipated costs" and that neither Golder's report nor EBM recalculated estimate included any level of contingency, which DIAND suggest the Board may wish to consider in calculating security.

Because DIAND's Land Division is also negotiating the establishment of a security for EBM's two land leases for land related reclamation, DIAND Water Resources Division recommended that the Board and Land Division harmonize security to avoid duplication of financial requirements.

DIAND admitted that the distinction between land and water-related reclamation costs is difficult to make due to their interconnected nature, but that the amount of security should be based solely on water-related components and be accessible by only one payee, in this case the Crown.

### D. Brodie Consulting Limited

The Nunavut Water Board retained the services of Mr. John Brodie (BCL) as an independent expert to assist with the issue of security deposit at the Lupin Mine. The objectives of his engagement were to review EBM's abandonment and restoration plan to assess if it is conceptually viable and if the proposed reclamation measures were reasonable, to review the estimated cost of carrying out the reclamation work, and to identify any requirements for studies, design work or reclamation trials that may be necessary in order to successfully complete the reclamation work. Mr. Brodie was asked to prepare a written report for all parties, and to appear at the hearing and be available for cross-examination on his oral (hearing) comments and his filed report.[33]

Mr. Brodie indicated that his opinion was based on the filed A&R plan and supporting information, but that he had not conducted an inspection of the site. He concluded that EBM's A & R Plan presented a reasonable approach

---

[33] Mr. Brodie did not visit the Lupin mine site in preparing his assessment; he filed his written report of the Ulu Project on March 20, 2000. The following information was examined in preparing his review of the reclamation cost:

- Initial Environmental Evaluation For The Lupin Gold Project, Contwoyto Lake, N.W.T., Feb. 1980,
- Abandonment and Restoration Plan, Water Licence N7L2-0925, Lupin Operations, January 1996,
- Letter from N.W.T. Water Board to Echo Bay Mines, Re: Interim Abandonment and Restoration Plan, April 4, 1996,
- Letter from Fisheries and Oceans to Echo Bay Mines, Re: Interim Abandonment and Restoration Plan, March 7, 1996,
- Land Lease 76 E/14-I-9 for Lupin Mine, Nov. 1997,
- Closure Cost Estimate and Scoping of Mine Closure Issues, Lupin Mine, N.W.T., by Golder Associates Ltd. and PCL Constructors Northern Inc., Dec. 1997,
- Echo Bay Mines Ltd. internal memorandum, re: Review of Lupin Closure Cost Estimate, Dec. 11, 1998,
- 1998 Annual Report, Echo Bay Mines Ltd. Lupin Gold Mine, Mar. 1999,
- Echo Bay Mines Ltd. Lupin Gold Mine, Renewal Water Licence Application, July 1999, and Supplementary Information, Oct. 1999,
- 1999 Geotechnical Inspection of the Tailings Containment Perimeter Embankments, Lupin Mine, Golder Associates Ltd., Oct. 1999,
- Screening Decision Report, Nunavut Impact Review Board, Re: Water Licence Renewal Lupin Mines, Nov. 1999,
- 24 color photographs showing an assortment of views of the Lupin Mine site, (date & photographer not identified).

for management of the potential impacts, which may arise after closure of the mine. Mr. Brodie insisted that his assessment of the cost to carry out the reclamation work was based on governmental work, meaning that the government would have to reclaim the site if EBM was unwilling or unable to do it for any reason. BCL further noted that his estimate was prepared assuming that there was no offsetting salvage value or recovery of inventory.

Based on a summary of the reclamation cost estimate as prepared by GAL/PCL in 1997, BCL indicated that adjustments should be made for the following:

- An adjustment of the 1997 estimate for work already completed;
- An adjustment of the 1997 estimate for not having to cover Cell 4 since tailings have not been placed in this area;
- An adjustment of the 1997 estimate for the effects of inflation up to 2000;
- Addition of a cost item for removal of hazardous materials from the underground mine and for off-site disposal of hazardous materials removed from equipment, buildings and fuel storage tanks;
- The unit cost for management of petroleum-contaminated soils is low at only $\$9.14/m^3$. On-site bio-remediation of contaminated soils may cost up to $\$50/m^3$. In addition, there may be other contaminated soil on the site. Allowance for an additional 5000 cubic meters of contaminated soil associated with the tank farm and fuel handling should be included in the reclamation cost estimate. The amount allowed for in the GAL/PCL estimate is deducted from the adjusted amount to avoid double counting;
- Addition of a cost allowance for decontamination of pipes and tanks in the mill;
- Addition of a cost allowance for covering demolition waste over the mill foundations or backfilled stops;
- Addition of a cost item for treating the tailings pond supernatant prior to placing the granular cover;
- Addition of a cost item for a quantity of riprap to stabilize the tailings dykes;
- Allowance for revegetation of the area impacted by the Lupin Mine development;
- Winter road costs were not included in the GAL/PCL estimate. It is assumed here that the winter road would be required for a full winter for one of the reclamation years and that it would be used on a limited basis for two years. Limited basis use means opening the road and maintaining it for a brief period, say 6 weeks for transportation of fuel and equipment to the site;
- Addition of a cost allowance for shipment of fuel to the site;

- Airfare costs for personnel movement are included in the estimate. However, occasional movement of equipment by air could be required as the nature of site activities change. This estimate is based on establishing the winter road in each of the three years for the reclamation work. Therefore, it is assumed that, if required, the cost for using the Hercules aircraft, or lesser equivalent, would be covered under the contingency cost;
- Addition of a cost allowance for mobilization and demobilization plus winter stand-by of contractors' equipment;
- Post-closure monitoring should be conducted. It is assumed that monitoring in each of five years would be carried out over a ten-year period;
- Allowance for engineering and reclamation studies at 1.5 % of the reclamation cost is included. Engineering work is expected to include: geotechnical studies, vegetation mixtures, audit and investigation of hazardous materials and contaminated soil; and,
- Allowance of a contingency at 10% of the project total is included. This rate is lower than the 15% rate suggested by Lupin Mine in the 1995 estimate (ref. GAL/PCL report page 12). The 10% contingency reflects the fact that that detailed engineering has been carried out using site-specific data and incorporating the results of reclamation efforts to date.

Based on the review of the reclamation cost estimate prepared by GAL/PCL in 1997 and adjustment for inflation and omitted items, BCL estimated that the government's cost for reclamation of the Lupin Mine would be $44.6 million, including a 10% contingency.

## IV. ANALYSIS

The Nunavut Water Board is seized with jurisdiction to consider this application pursuant to the NCLA, Article 13. According to Article 13.7.1, no person may use water or dispose of waste into water without the approval of the NWB.

Under section 13.8.1 of the NCLA, the NWB has the authority to request a broad range of information from an applicant for an approval, including information regarding steps to avoid and mitigate adverse impacts and any other matters that the NWB considers relevant.

The burden of proof in this hearing rests with the applicant, EBM. The NWB Rules of Practice state: "In cases in which the Board accepts evidence, the party offering such evidence shall have the burden of introducing appropriate evidence to support its position. Where there is conflicting evidence, the

Board will decide which evidence to accept and will generally act on a balancing of the evidence".[34]

## A. The assessment of the overall cost of reclamation or abandonment and restoration of the Lupin site and total amount of security required of EBM

Interconnectedness of Land and Water

The issue regarding whether land and water should be assessed separately or together when determining security costs must again be decided by the Board. In one of the Board's previous decisions,[35] the Board reached the conclusion that there is a connectedness between land and water. We agree that these principles apply to Lupin's licence renewal. All elements of the environment, including land and water, are interconnected; what affects one part of the environment can ultimately have an impact on other environmental elements. By altering the natural elements of the environment, traditional Inuit culture and use of the land and water can be directly affected. The Board recognizes that the following factors related to water, from mining activities, can affect Inuit culture:

- the effect or potential effect of the economic activity resulting from the proposed use;
- the effect or potential effect on fish and wildlife resources and on Inuit and other public recreational opportunities;
- the effect or potential effect on public health;
- the effect or potential effect of losses of alternative uses of water that might be made if not eventually precluded or hindered by the proposed use; and
- the intent and ability of the applicant to complete the remediation and restoration.[36]

It is difficult to separate land reclamation procedures from water reclamation procedures. Federal legislation recognizes the relationship between land and water in their definitions of environment. The *Canadian Environmental Assessment Act* defines environment as:

> the components of the Earth, and includes,
> a) land, water and air, including all layers of the atmosphere,
> b) all organic and inorganic matter and living organisms, and
> c) the *interacting natural systems* that include components referred to in paragraphs (a) and (b).[37]

[34] *Interim Rules of Practice and Procedure for Public Hearing*, Section 8.10.
[35] *Re BHP Diamonds Inc*. (1999), 29 C.E.L.R. (N.S.) 248.
[36] See, e.g., *Re BHP Diamonds Inc*. (1999), 29 C.E.L.R. (N.S.) 248 at 260.
[37] S.C. 1992, c. 37, s. 2 [emphasis added].

Environment is defined in the *Canadian Environmental Protection Act* as follows:

> environment means the components of the Earth, and includes,
> a) air, land, and water,
> b) all layers of the atmosphere,
> c) all organic and inorganic matter and living organisms and
> d) the *interacting natural systems* that include components referred to in paragraphs (a) to (c).[38]

The *NWT Environmental Protection* Act[39] defines environment in the same manner as the *Canadian Environmental Protection* Act. These definitions concur with the traditional belief of the Inuit regarding the land…which includes all of nature: the earth itself as well as the water, the ice, the wind, the sky, the plants and animals.[40]

Before steps are taken to reclaim land, the potential effect of the procedures on the hydrologic patterns in the area must be assessed. If water movement is affected or impaired by the land reclamation procedures, this would ultimately add to the costs of the water reclamation procedures. The interconnectedness of land and water are obvious and they cannot be reclaimed in isolation. This is supported by the DIAND, who in this hearing stated that the distinction between land and water related reclamation costs is difficult to make due to their interconnected nature.[41] The Board acknowledges that their authority is limited to issuing water licenses and not land use approvals[42] but we also base our decision supporting the link between land and water on a broad interpretation of the fresh water cycle.

The Board did not receive any compelling evidence that would suggest that an accurate distinction between land and water components could in this case be made in the assessment of abandonment and restoration costs. Therefore, consistent with its analysis contained in previous decisions, the Board has decided not to separate land and water related components of the overall abandonment and reclamation plan and resulting cost assessment. However, the Board recognizes that the landowner will, in the future, require its own security from EBM pursuant to the conclusion of negotiations for a land lease. If the landowner's lease-based security duplicates items covered by this water licence, EBM may apply to the Board to amend the security amount of this licence downward to account for such duplication.

---

[38] R.S.C. 1985, c. 16 (4th Supp.), s. 3 [emphasis added].
[39] R.S.N.W.T. 1988, c. 75 (Supp.), s. 2(c).
[40] *Re BHP Diamonds Inc*. (1999), 29 C.E.L.R. (N.S.) 248 at 262.
[41] D. Livingstone, Indian and Northern Affairs, Renewal of Water Licence NWB2ULU9700 (March 17, 2000).
[42] L. Webber, DIAND, Applications by Echo Bay for renewals of Lupin and Ulu water licenses; Reply submissions (April 25, 2000). Among other things, Mr. Webber reiterated that the Board can determine quantum for the security deposit but the form of the security is to be determined between the licensee and the Minister of Indian Affairs and Northern Development.

Asset Value

EBM wants the Board to categorize the salvageable value of EBM assets as a credit against the final A & R calculation. After reviewing all of the submissions, we must hold firm to the principle that sufficient security is needed to protect the public's interest in water quality and to ensure that the Crown will not be left to bear the cost of reclamation. The Board concludes that EBM's asset credit proposal is not acceptable, largely because of: 1) the difficulty in tracking the priority of security interests and/or liens in major assets, and, 2) because of the likelihood that such assets, if valuable, would likely disappear quickly in the unfortunate (and never planned) case of insolvency. Therefore, the Board accepts Mr. Webber and DIAND's position regarding the use of salvageable assets as part of the security. The reasons listed by DIAND include:

- the Crown may not have a legal right to the salvageable assets;
- it cannot be predicted what assets will actually be on site, who has rights to the assets, what condition the assets will be in, and the actual value on that date;
- the actual value realized for the asset may be lower than anticipated;
- costs associated with preserving and disposing of the assets; and the Crown may not want to assume ownership of the assets.[43].

Use of Third-Party Contractor

BCL told the Board to rely on the premise that third-party contractors will need to be used in calculating the amount of security. Mr. Brodie based his calculation on the assumption that EBM does not carry out the reclamation work at the Lupin Mine; therefore, it becomes necessary for the Government and landowners to hire contractors to reclaim the site. BCL furthermore stated that this approach was consistent with other assessments of reclamation costs for mining project in Nunavut made on behalf the Government. The Board fully agrees with this approach and accepts BCL's calculation.

Amount

In setting the security amount, the NWB concludes that the BCL third-party estimate represents a more realistic estimate at the actual cost at $44.6 million. The Board also agrees with his inclusion of costs to open and maintain a winter road in the overall assessment of the reclamation costs, excluding potential revenues from other users of the road. If for some reason EBM cannot or does not reclaim the mine site, the government would be

[43] *Ibid.*

required to maintain road access to the site, and hire other contractors to complete the reclamation work ... the costs will be higher. However, if EBM does complete the work with its own resources, the actual cost may be reduced.

The Board also accepts DIAND's position that the amount of security should cover the full cost of abandonment and restoration, leaving no risk to the taxpayer of having to pay these costs. Consistent with this principle, the Board generally agrees with the BCL estimate. However, we agree that cost estimates for reclamation work should be lowered to account for labour costs based on an overtime averaging permit, cost reductions in the general expense category, inflation adjustment based on historical data, and cost reductions in the fuel delivery expense. We believe that BCL calculations should be reduced by approximately $8 million to take these corrective factors into account. Therefore, due to these adjustments, the Board has decided to establish the general cost of A & R at approximately $36.6 million. This amount represents the governmental cost to carry out all necessary A & R work in the event that EBM is unable or unwilling to carry out the reclamation of the Lupin Mine.

This amount represents the benchmark against which the Board establishes the *upper* limit for governmental or landowner cost of A & R of the site. After having set this ceiling, the Board decided to consider additional factors, which are significant "fine-tuning factors": a) the ability of the applicant to pay the cost of security; and, b) the past performance by the applicant in respect of any other licence.

To illustrate, EBM has complied with the terms of the existing water licence and has self-reported any incidence of the terms being breached[44]. Therefore, the Board allows a 10% reduction ($3,660,000), again based on EBM's compliance record and history of good competent behavior.

The Board also agrees that since EBM received its operating licence almost 20 years ago, it should be treated at least **somewhat** differently than if it was a brand new mine with no proven track record. Indeed, the Board agrees in this regard with DIAND's "Consultation Document on Mine Reclamation Policy for the Northwest Territories"[45], referenced in its initial submission to the Board[46], which states:

---

[44] Having said this, similar environmental concerns are shared by all operating mines - even those mines that renew their licenses today. Ultimately, the Board believes that the public should not bear the cost of environmental cleanup regardless of the corporate or historical circumstances.

[45] Consultation Document, Mine Reclamation Policy for the Northwest Territories. Indian and Northern Affairs Canada. Not dated.

[46] "Nunavut Water Board Public Hearing for the Renewal of Licence Number N7L2-0925, Echo Bay Mines Ltd. - Lupin Mine. Indian and Northern Affairs Canada. Public Hearing Intervention. March 28-29, 2000." Page 10, Section 6.

> "The reclamation measures required of existing producing mines would need to recognize the economic status of these operations, including the remaining mine life. Reclamation would have to be evaluated on a case-by case basis, taking into account the specific situation of the operation, the potential environmental impacts and the constraints imposed by other legislation.
>
> Any additional financial assurance required from existing producing mines would take into account the financial capacity of the mining company to provide the additional financial assurance, as well as the magnitude of risks posed by the operation.
>
> Existing mines that are temporarily closed at the time of announcing this policy would be required to provide an acceptable up-to-date reclamation plan at the time of resumption of operations, which would require that appropriate amounts of financial assurance be put in place. This reclamation plan would include the measures to be undertaken in the event of further suspension of operations and the timing of such measures."

Consequently, the Board decides to further decrease the security by another 10% ($3,660,000) to take into account the fact that Lupin is an existing mine that has been in operation for almost 20 years.

**The final security amount required of EBM for the Lupin Mine is therefore set at $29.2 million.**

Form of Security

The NWB agrees with Mr. Webber and DIAND that the form of security in this case is a matter to be determined between the Licensee and the Minister. EBM earnestly pressed the Board to use a trust fund as their form of security interest. According to EBM, there are tax benefits attached to this concept. The Board agrees that this option has promise; as well, Lupin's previous license refers to it.

Thus, we forward the trust concept to the Minister for his evaluation for future licenses and for whatever conclusions he might eventually reach – most likely by way of amendment to statute, regulation, or order in council. In the meantime, however, and given the facts of this case, the Board feels that the only alternatives available for the EBM security instrument are those currently codified in the *NWT Waters Act Regulations*. These forms of security are:

i. a promissory note guaranteed by a bank in Canada payable to the Receiver General;
ii. a certified cheque drawn on a bank in Canada payable to the Receiver General;
iii. a performance bond approved by the Treasury Board of Canada;
iv. an irrevocable letter of credits from a bank in Canada; and
v. cash.[47]

[47] *Re BHP Diamonds Ltd.* (1999), 29 C.E.L.R. (N.S.) 248 at 268.

Installments

Recognizing the fact that security should always be commensurate with the actual costs to conduct A & R, which are ongoing, the Board does believe the security should be paid in installments so that the security expenditures can somewhat be synchronized with the operations of the mine. The Board asks DIAND to reach agreement with EBM on the installment schedule. One option would be a requirement that EBM pay 10% ($2.92 million) of the total security upon issuance of the licence, and the balance spread equally over the remainder of the term of the licence.

Periodic Review

Given that the security is relatively large and the mining future, including the price of gold, is relatively uncertain, the Board has decided that the security issue should be regularly visited. We therefore put all parties in this hearing on notice that there must be annual A & R reporting and security **updating**. For example, if on the annual anniversary date the licence holder believes the security formerly established should be reduced due to evidence not previously available, then the applicant should apply to have the amount and/or payments curtailed. Conversely, if any party including the applicant sees new circumstances that would require elevating the security, then an application can be filed to increase the amount of security.

## B. Water Use

EC/DFO told the Board that EBM should continue to strive to reduce water usage through improved conservation and recycling practices, and DIAND recommended that EBM submit a Water Conservation Plan to reduce fresh water requirements and decant volumes so as to minimize the impact of the TCA decant. EBM did not request any change in the quantity of freshwater, and maintained that all efforts were taken to ensure conservation within the mining process.

The Board accepts EBM's assurances that all appropriate measures are taken to ensure optimal use of water throughout the mining process. **The Board decides to allow a maximum annual water use of 1.7 million cubic meters** . In the absence of evidence of excessive use of freshwater or conservation problems in the operation of the mine, the Board does not see the need to request from EBM the submission of a Water Conservation Plan at this time. Among several annual reporting requirements, **the Board will ask EBM to measure water use annually**, and it may require EBM to implement conservation measures in the event of substantial increase in the use of water.

## C. Regulated Discharge Parameters and SNP

Nutrients

Both EC/DFO and DIAND recommended several changes to the SNP, particularly to assess nutrient loading from sewage discharge and potential impacts to the surrounding environment, particularly on water quality and plant, phytoplankton, zooplankton and fish communities downstream. The Board agrees that nutrients are generally associated with sewage, and that they should have been monitored under the SNP in previous licences. **The Board decides to add total Phosphorus, orthophosphorus, total nitrogen, nitrate and nitrite to the sampling requirements (but not as regulated discharge parameters) for SNP Station 925-14, to be sampled on the first day of discharge and monthly thereafter during periods of flow.**

Additionally, EC/DFO asked the Board to establish a new SNP station in the receiving bay of Contwoyto Lake to measure nutrient levels reaching the lake. EBM told the Board that the treated effluent at SNP Station 925-14 flows through a considerable wetlands area before entering Contwoyto Lake and that nutrient uptake by vegetation is occurring in this area. In the absence of data on nutrient levels at SNP Station 925-14, **the Board concludes that it is premature to monitor nutrients entering the receiving bay of Contwoyto Lake. However, the Board will reassess the need to establish a new station in the receiving bay of Contwoyto Lake following the review of monitoring data from SNP Station 925-14.**

Toxicity Testing of Effluent

The Board notes that EBM has been proactive in protecting of fish resources by testing effluent from the TCA for toxicity prior to discharge. EC recommends bioassay testing of effluent at the end of the discharge in order to assess changes in effluent quality with drawdown of the pond. The Board agrees with EC's recommendation[48] that **bioassay testing of discharge from the TCA should not only be conducted prior to initiation of discharge but also just prior to the termination of decant.**

[48] EC April 14, 1999 submission suggested wording for licence as follows: "Effluent at Station number 925-10 shall be sampled twice each year, prior to initiation of decant and just prior to termination of decant, and the samples will be provided to the Environmental Protection Branch of Environment Canada for the purpose of performing a static pass/fail bioassay for both rainbow trout and *Daphnia* species (per Environment Canada's Environmental Protection Series Biological Test Methods."

Monitoring of Total Cadmium, Alkalinity, Hardness, and Ammonia at SNP Stations 925-10,14, 20, 21,22,24,and 25

DIAND wants the Board to order EBM to monitor cadmium, ammonia, alkalinity, and hardness at SNP Stations 925-10, 14, 20, 21, 22, 24, and 25 to aid in the interpretation of data and assessment of discharge impacts from the Sewage Lakes system (at SNP Station 925-14) or the TCA (at SNP Stations 925-10, 20, 21, 22, 24, and 25). In support of this request, DIAND points out that alkalinity and hardness can influence the uptake of metals in freshwater systems, and that cadmium and ammonia are toxic to aquatic life. On the other hand, EBM told the Board that waters from the area are neither alkaline nor hard; however, without substantiating this statement with actual data.

The Board agrees that monitoring of these parameters would provide useful information to aid in the interpretation of impacts of discharge, and decides to **add these parameters, for monitoring purposes only, at SNP Stations 925-10, 20, 21, 22, 24 and 25, to be sampled weekly during periods of discharge from the TCA, and at SNP Station 925-14 to be sampled on the first day of discharge and then monthly thereafter during periods of flow.**

Oil and Grease

EC/DFO told the Board that fuel and lubricant residues may be found in minewater, and oils are found in camp wastes. The Board agrees that oil and grease can be present in both the Sewage Lakes discharge and the TCA discharge. **The Board decides to add Oil and Grease as regulated parameters for visual sheen at both effluent discharges, and to the SNP for weekly monitoring for visual sheen at the discharge from SNP Station 925-14.**

ICP-MS Scan of 24 total metals at SNP Stations 925-10 and 15

DIAND asked the Board to request EBM to perform an ICP-MS Scan of 24 total metals at SNP Stations 925-10 to be sampled on the first day of discharge and monthly thereafter during periods of flow, and at SNP Station 925-15 on the first day of discharge. **The Board agrees that data from an ICP-MS scan of 24 metals at the discharge from pond no. 2 would be useful and decides to add this requirement in the licence**. While the Board concedes that data from an ICP-MS scan of 24 metals at Station 925-15 would help assessing the performance of the two-pond Tailings Containment system, the Board accepts EBM's position that the movement and quality of water within the TCA is part of the internal workings of the system. The Board is indeed concerned with the quality of the effluent at the final point of discharge from the TCA (Station 925-10), but water quality within

the TCA is not a concern to the Board unless monitoring at Station 925-10 would identify deficiencies or problems with the current treatment process.

Combining Effluent Discharge Parameters

EC/DFO recommended that the Board combine the effluent discharge limits from the Sewage Lakes Discharge and the TCA, where applicable, which would mean lowering the limits for some parameters (e.g. lead, copper, nickel, zinc, total suspended solids) at one discharge point to the lower limits at the other point. EBM disagreed with this recommendation and did not see any rationale for doing so. The Board notes that EBM has generally met the limits at both waste discharge points, and agrees with EBM that there is no need to combine, and by the same token lower some of, the effluent discharge limits.

## D. Tailings Containment Area (TCA)

DIAND and EC/DFO told the Board that EBM should be required to assess the capacity levels of the TCA. DIAND asked that the report examine remaining capacity in the TCA compared with remaining Lupin reserves and additional ores to be processed at Lupin (for example, ore from Ulu and possibly kimberlite), plans for future modifications of the TCA, and the chemical interactions between the Lupin tailings and other wastes in terms of acid generation, decant water quality, and thermal properties. In addition, EC/DFO told the Board and EBM to provide a rationale for the selection of options to increase the capacity beyond the currently estimated 5.1 years available and to avoid as much as possible the use of End Lake as an option to increase the capacity of the TCA. While EBM also told the Board that it needs that type of information in order to operate effectively and keep its reclamation requirements to a minimum and that it has indeed already surveyed Cells 3 and 5 of the TCA in the fall of 1999, it argued that this information was merely an internal operational aspect of the TCA management.

The Board agrees with DIAND and EC/DFO that the capacity of the TCA is a crucial aspect of the management of the tailings of the mine, and that timing and location of tailings deposition, including the interactions between tailings of different composition, throughout the remaining life of the mine is essential. Therefore, the Board directs EBM to submit a **TCA Management Report, updated annually in the form of an addendum to the Annual Report, to examine the capacity of the TCA against remaining ore reserves and additional ores to be processed at the mine. The plan shall include plans for future modifications, and a rationale for the selection of options to increase the capacity of the TCA. The report shall discuss the effectiveness of granular cover, including an evaluation of coarse**

**kimberlite tailings that were used as cover material in some areas of the TCA, to induce permafrost aggradation and the release of acidic drainage from the tailings, and the interactions between tailings of different sources in term of their acid generation, decant water quality, thermal properties, and any other issues as requested by the Board following annual review.**

### E. Dam and Dyke Stability

DIAND told the Board that the stability and structural integrity of dams and dykes forming the TCA was crucial, not only in terms of operations but also of closure. DIAND and EC/DFO also noted that some thermistors were inoperative and recommended that they be repaired or replaced, a recommendation which was also found in the 1999 Geotechnical Inspection performed by EBM. The Board agrees that maintaining the integrity of the TCA now and in the future is essential to avoid failure and consequential environmental damages.

**The Board directs EBM to conduct an annual geotechnical inspection of all dam and dyke structures, and EBM will be required to implement the recommendations of the geotechnical engineer who has performed the inspection. In addition, the Board instructs EBM to repair or replace all inoperative thermistors to obtain consistent data for the frozen core dams. EBM shall also install new thermistors in the centre of Cell 1, adjacent to Dam 3 D which borders Pond 1, and at the point where tailings depth is the greatest. Data collection should be monthly and reported annually to the Board in the annual report.**

### F. Data on 1992 Tailings Spill

EC/DFO asked that EBM provide a summary and interpretation of data collected on the recovery of, and residual effects on, Long Lake, which was affected in 1992 by a tailings spill from Cell 4 of the TCA. EBM replied that the information was available and **agreed that it would be compiled for presentation to the Board.**

### G. Acid Rock Drainage (ARD)

DIAND recommended that the Board require a survey of the Acid Base Accounting (ABA) characteristics of waste rock used for past construction (of roads, airstrips, pads, etc.), and that rocks to be used for future construction be sampled and kinetic testing be done before any waste rock is selected for that purpose so that only non acid generating and low soluble material be

used. EBM indicated that "very little if any waste rock is now brought to the surface"[49], but agreed that these studies should be done preferably in the context of the preparation of the A & R Plan. In addition, DIAND suggested that the Board require EBM to study the potential interactions between the tailings ponds, the dams, and the tailings cells and the temperature changes in these structures. **The Board agrees with DIAND. Specifically, EBM shall study the potential for interaction between covered cells and flooded areas of the TCA, and include thermal analyses and modelling of the interaction between the ponds, the frozen-core perimeter dykes, and frozen tailings within cells, and address the thermal effects of proposed pond elevations.**

EC/DFO shared DIAND's view and would like EBM to look at the effectiveness of granular cover, including an evaluation of coarse kimberlite tailings that were used as cover material in some areas of the TCA, to induce permafrost aggradation and the release of acidic drainage from the tailings. **We agree that this should be done in conjunction with the TCA Management Report contemplated above.**

DIAND also wanted EBM to sample currently exposed tailings surfaces to track oxidation rates and developing loads of oxidation products within the TCA to ensure that water quality is not affected. **We agree that this should be done in the event that the mine enters into Care and Maintenance and in the context of the preparation of the final A & R Plan.**

DIAND asked the Board to request EBM to study potential contamination by mine water from underground mine walls as part of the reopening of the mine. DIAND added that EBM should also assess potential release of contaminants from underground walls (wall wash studies) to the water column when the mine is flooded at closure. On the other hand, EBM argued that because airflow in the underground workings ceased when the mine was put under care and maintenance, minimal oxidation occurred during that time. In addition, EBM maintained that airflow at closure would be cut, thus limiting the risk of oxidation, and that in any event, any discharge of minewater to the Sewage Lakes system or to the TCA would still have to meet the respective effluent quality limits imposed in the licence. **The Board agrees with EBM. However, oxidation potential in general shall be discussed in detail in the preparation of the final A & R**.

Finally, DIAND told the Board to conduct a long term study on the esker covered tailings in cell 1 to examine the growth of permafrost into the tailings, and the possible impacts from pore water pressure. The Board agrees that such study would be useful in assessing permafrost aggradation into tailings deposits. The study shall include: (1) continued measurement of ground temperatures; (2) general stratigraphy of Cell 1; (3) measurement of surface

[49] Exhibit # 2

uplift of Cell 1; (4) measurement of pore water pressure in the tailings; (5) sampling and testing of the solute concentration of unfrozen pore water; and (6) electromagnetic surveys to determine ground conductivity.

### H. Abandonment and Restoration (A & R) Plan

DIAND and EC/DFO asked the Board to require EBM to submit the final A & R Plan for the mine at least three years before the mine closes, and that the Plan be subject to annual updates in the form of a stand-alone addendum in the Annual Report submitted to the Board. DIAND would like the final A & R to include, among other things, an outline of methods to contain potential pore water expulsion from the TCA, identification of sites of contaminated soils at the minesite, identification of areas with appropriate esker material for TCA cover, the amount needed to cover cells, a summary of existing data for background levels of metals in the area, and identification of needs for verification of data or reassessment with modern detection limits. EBM agreed to these recommendations and told the Board that Golder had already prepared a report for EBM entitled “Closure Cost Estimate and Scoping of Mine Closure Issues, Lupin Mine, NWT”, which recommendations will be included in the final A & R. **The Board directs EBM to prepare the final A & R Plan based on DIAND’s recommendations as well as on the Golder report, and to submit this plan at least three years before closure of the mine.**

### H. Term of the Licence

The Board decides that the term of the licence should be 8 years. In reaching this conclusion, the Board agreed with EBM that the licence should coincide with the current life of mine plan and extrapolated geological data, with steady planned production over five years and decreasing production for the following three years during which period EBM would be required to submit its final abandonment and restoration plan. Further, by agreeing to an annual (periodic) review of the security issue, the Board finds that the shorter-term licence rationale advanced by other parties is better actualized.

## I. CONCLUSION

For the reasons listed above and pursuant to Article 13 of the Nunavut Agreement, the Board approves the application to renew EBM’s Lupin Mine licence subject to the conditions herein and the details provided in the licence attached in Appendix C.

**Enforcement**.

The Board believes the issue of enforceability lies in the hands of the DIAND. While it is true that licence suspension is ultimately in the hands of the Board, we believe that failure to comply with this licence will violate at least the *Northwest Territories Waters Act*,[50] and the licensee will be exposed to the enforcement measures and penalties provided for by the Act. Inspectors appointed under the Northwest Territories Waters Act will therefore enforce the terms of this water licence.[51]

[50] 1992, c. 39.

[51] L. Webber, DIAND, Applications by Echo Bay Ltd. for renewals of Lupin and Ulu water licences; Provisions with respect to powers of inspector (April 5, 2000). If subsequent to the issuance of the licence the *Northwest Territories Waters Act* is replaced by other federal legislation and to the extent it is consistent with the Nunavut Land Claim Agreement, the other federal legislation shall apply with respect to the licence and the *Northwest Territories Waters Act* will no longer apply to the licence.

## APPENDIX A – LIST OF SUBMISSIONS AND CORRESPONDENCE

Application for water licence renewal for EBM's Lupin Mine, received July 12, 1999.

### Initial Submissions:

1. Letter dated December 8, 1999. NIRB Screening Decision and Attached Screening Forms. Larry Polok Aknavigak, Chairman, NIRB.

2. Submission received March 17, 2000. "Indian and Northern Affairs Canada Public Hearing Intervention March 28-29,2000" David Livingstone, Director Renewable Resources and Environment, DIAND. (English and Inuktitut).

3. Submission received March 17, 2000. "Department of Fisheries an Oceans an Environment Canada's Joint Submission to Nunavut Water Board on an Application for Renewal of Water Licence NWB2ULU9700(Ulu Exploration Program by Echo Bay Mines Ltd." Laura Johnston, Manager, Northern Division, Environment Protection Branch, Environment Canada, Yellowknife, and Ron Allen &Burt Hunt, Area Directors, Fisheries and Oceans, Yellowknife. (English and Inuktitut).

4. Submission received March 20, 2000. "Ulu Project-Review of A&R Plan and Reclamation Cost Estimate" John Brodie, Brodie Consulting Ltd. Vancouver.

### 1st Round of Submissions re: Public Hearing

1. Letter dated March 31, 2000. " Applications for EBM for renewals of Lupin and Ulu water licenses; Schedule for post-hearing submissions." Lee F. Webber. Legal Counsel to Intervenor DIAND. Department of Justice Canada. Yellowknife.

2. Letter dated April 14, 2000. "Re: Comments of Echo Bay Mines Public Review for New Water Licence." Chris Nichols. Manager. Coordination of Environmental Assessment and Claims Implementation. Department of Sustainable Development. Government of Nunavut. Iqaluit.

3. Letter dated April 14, 2000. "Re: Request for Comments Echo Bay Mines Limited Response to Interventions submitted during the Water Licence Renewal and John Brodie's Review of A&R Plan and Reclamation Cost Estimate." Brian Collins. A/Head, Regulatory Approvals, Water Resources Division, DIAND. Yellowknife.

4. Letter dated April 14, 2000. “Re: Echo Bay Mines Limited Application for Licence Renewals for the Lupin Mine operation and Ulu Exploration Project.” Anne Wilson, Water Pollution Specialist, Environment Protection Branch, Environment Canada. Yellowknife.

5. Letter received April 14, 2000. “Re: Renewal Lupin Water Licence –N7L2-0925; Renewal Ulu Water Licence-ULU9700; and Reclamation Surety & Liability.” Bill Danyluk, Mine Manager. Lupin Operations. Echo Bay Mines Limited.

6. Submission dated April 13, 2000. “Echo Bay Mines Limited Lupin Operation-Reclamation Liability for the Lupin Mine, A review of the Closure Cost Estimate Provided to the Nunavut Water Board by Brodie Consulting Ltd.” Hugh Ducasse, Manager, Loss Control and Environmental Affairs, Echo Bay Mines Limited.

**2nd Round Submissions re: Public Hearing**

1. Letter dated April 25, 2000. “Re: Request for comments-Echo Bay Mines Limited’s review of reclamation liability for the Lupin Mine” David Milburn, Manager, Water Resources Division, DIAND. Yellowknife.

2. Letter received April 25, 2000. “Re: Renewal Lupin Water Licence –N7L2-0925; Renewal Ulu Water Licence-ULU9700; Reply to Submissions.” Bill Danyluk, Mine Manager. Lupin Operations. Echo Bay Mines Limited.

3. Letter dated April 25, 2000. “Applications for Echo Bay Mines Limited for renewals of Lupin and Ulu water licenses; Reply submissions.” Lee F. Webber, Legal Counsel to Intervenor DIAND. Department of Justice Canada. Yellowknife.

## APPENDIX B – LIST OF EXHIBITS FILED AT THE MARCH 28, 2000 PUBLIC HEARING

1. Public Registry. “N7L2-0925 Echo Bay Mines Limited Lupin Project.” Nunavut Water Board. Gjoa Haven.

2. Submission dated March 26, 2000. “Echo Bay Mines Limited-Prepared responses to technical comments and recommendations submitted by interveners during the Water Licence, Public Hearing process.” Prepared by David Hohnstein, Environmental Coordinator, Lupin, and Hugh Ducasse, Manager, Loss Control and Environmental Affairs, Echo Bay Mines Limited. Exhibit filed by Echo Bay Mines Ltd.

3. Final Report on Technologies Applicable to the Management of Canadian Mining Effluents. Prepared by SENES Consultants Ltd. for Environment Canada. March 31, 1999. Exhibit filed by DIAND.

4. Consultation Document. Mine Reclamation Policy for the Northwest Territories. Department of Indian Affairs and Northern Development. With cover page dated March 20, 1998 from Bob Overvold, DIAND Regional Director General, Northwest Territories. Exhibit filed by DIAND.

5. Fourteen undated colour photographs of abandonment and reclamation at Port Radium (NWT), Boulder Creek, and Borealis. Exhibit filed by Echo Bay Mines Ltd.