

# Appendices



# Appendix A

**2002 Phase II Environmental Site Assessment, Nanisivik Mine,  
Nunavut, Gartner Lee Limited for CanZinco Ltd., January 2003  
(included with electronic distribution only)**



## **Appendix B**

**Complete record of documentation pertaining to the Nunavut Water Board review of the report, 2002 Phase II Environmental Site Assessment, Nanisivik Mine, Nunavut, Gartner Lee Limited for CanZinco Ltd., January 2003**



March 21, 2003  
P13808.03

Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NU  
X0E 1J0

**Attention:** Ms. Dionne Filiatrault, P.Eng.,  
Senior Technical Advisor

Dear Dionne:

**Nanisivik Mine - Reviews of Phase II  
Environmental Site Assessment (ESA) Report,  
Emergency Response Plan (ERP) Report,  
and Human Health and Ecological  
Risk Assessment (HHERA) Report**

As per your request , Acres has undertaken preliminary reviews of the following documents:

- ▶ Phase II Environmental Site Assessment (ESA) for the Nanisivik Mine, as prepared by Gartner Lee Limited for Canzinc Ltd. and issued on January 30, 2003. The Phase II ESA report was submitted as per Section G, Item 13 of the Water License NWB1NAN0208.
- ▶ Emergency Response Plan (ERP) prepared by Nanisivik Mine/Canzinc Ltd. and issued on February 28, 2003. The ERP report was submitted as per Section E, Item 1 of the Water License NWB1NAN0208.
- ▶ Human Health and Ecological Risk Assessment (HHERA), as prepared by Jacques Whitford Environment Limited For Canzinc Ltd., and issued on January 30, 2003. The HHERA report was submitted as per Section G, Item 14 of the Water License NWB1NAN0208.

The first two reports were reviewed internally by Acres. A list of items that need to be discussed and clarified during the proposed technical meeting to be held in Iqaluit on March 28, 2003 are described hereafter. The third report (HHERA) was reviewed by Dillon Consulting Limited (Dillon) of Cambridge, Ontario on behalf of Acres. Unfortunately, the report by Dillon is not currently available for your review. We will keep inform on the status of Dillon's review report on HHERA. They have indicated to us that the review report will be available on March 25, 2003. We will fax a copy of the report to you as soon as it becomes available.

## **1. Issues Related to the Phase II ESA Report**

### **1.1 Report Format**

Overall, the Phase II ESA report addresses most of the issues in a format which is similar to the one recommended by the Canadian Standards Association (CSA Z769-00 Standard for Phase II ESA). However, there are several items which may need to be brought to attention:

- ▶ Chapter 6 of the report identifies the contaminants and areas of environmental concern. This culminates the conclusion of the report, based on the site assessment and evaluation of the field investigations. However, the report must also include a summary for other contaminants and/or issues such as marine sediments, air quality/dust monitoring, surface water quality and acid rock drainage. These topics are discussed and summarized in Chapter 3, but they are excluded in the final conclusion of the report or in the Executive Summary.
- ▶ The report provides some referenced documents which are relevant to the studies (such as foot-noted references shown in Page 6). However, not all of the referenced materials are documented. A full list of references and supporting documents should be included in the report.

## **1.2 Sampling Method**

For the field investigation program, there are various methods which can be employed for determining the sampling program. One of the methods utilizes random sampling through a grid system, another method is to collect samples based on preselect locations, or based on prescreening of potential or historical occurrence of contaminations (such as known areas of spills, heavy traffic, or intense activities, etc). In some cases, both methods are utilized to provide the best possible coverage of the area, and to obtain representative samples.

In general, the field investigation program which was performed for the Phase II ESA at Nanisivik Mine appears to follow the preselect sampling program using judgmental approach rather than a systematic grid system. Because of the large area of the mine site to be covered, this approach may be the most realistic one. However, how much confidence does the assessor have on this sampling method, and are there any areas which may have been inadvertently missed, or may require further investigations?

## **1.3 Issues in Phase I ESA and Interim Phase II ESA Reports**

One component of a Phase II ESA study is to review the existing Phase I ESA report, as well as other background information. The Phase I ESA and the interim Phase II ESA reports, which were prepared by Nanisivik Mine, describe clearly the main issues and concerns related to the landfill and the landfarm.

Section 3.5 of the report (pp. 33 to 35) discusses the possible contaminants and potential areas of concern, which form the basis for and the direction of the Phase II ESA studies. However, the landfill and landfarm were excluded in this section of the report. Have the assessor at this point considered that the issues and concerns described in the Phase I ESA and interim Phase II ESA did not warrant further investigation?

One of the specific issues which were described in the Phase I ESA and interim Phase II ESA was the concern over the drums of waste oil and glycol buried in the landfill. The Phase II ESA report did not discuss or mention about this issue. Has the sampling and testing of soil and

groundwater in the area, performed as part of the Phase II ESA studies confirmed that there is no concern associated with this issue? Such assessment, evaluation and conclusion must be included in the report. Are there any additional investigations required, such as geophysical survey for buried steel structures/drums as recommended and presented by EBA and Government of Nunavut in their presentation for the public hearing in July 2002? Will installation of additional monitoring wells and a monitoring program be required to specifically follow up to this issue?

Either way, it is critical that the Phase II ESA provides a closure to the questions and concerns addressed by previous reports, including Phase I ESA, and concerns brought up during the public hearings in July 2002.

#### **1.4 Phase II ESA and Nanisivik Mine's Closure and Reclamation Plan**

The CSA Standard describes the requirements, recommended practices, and various phases of the studies for an environmental site assessment. Phase I ESA is a non intrusive study, intended to identify actual and potential site contaminations via record reviews, site visits and interviews. In contrast, Phase II ESA is an intrusive undertaking, involving sampling, drilling and testing to further determine, confirm or discard the issues identified in the Phase I study. Phase II study may be repeated or expanded as necessary to solve or answer all of the concerns. Phase III ESA is generally undertaken to develop remedies for contaminated sites. Such steps may be included as part of the Closure and Reclamation plan. Between the Phase II and Phase III of the ESA, a human health risk and ecological risk assessments could be required to determine acceptable risk for any specific site.

The Phase II ESA report does not appear to summarize or indicate whether additional investigations are required, or whether the studies are complete and all of the issues have been satisfactorily addressed. It does not provide comments for any future activities or actions which may be required to ensure that environmental concerns are taken care of for the remediation phase of the work. As an example, there are no discussions about the facts that the field investigations were limited by the presence of existing buildings and structures, at which locations samples could not be economically collected. However, this shortcoming does not mean that these areas are excluded from the concerns of the potential contamination. A discussion or statement must be made in the report addressing these potential concerns, such as dealing with potentially contaminated soils under the existing tank farms, buildings, etc.

#### **1.5 2000 Marine Sediment Studies**

CCME provides sediment quality guidelines for evaluation of potential contamination concerns in the marine environment. The discussion, review and evaluation of the field tests and previous reports, including the 2000 study by Dr. Bo Elberling were presented in Section 3.1. It was indicated that elevated metal concentrations were encountered on some sediment samples taken in Strathcona Sound during the 2000 study (pp 23-24). However, the Phase II ESA does not provide an evaluation of these test results, as well as other previous studies, using the CCME guidelines for marine sediment samples. The results and findings of this section of the report are not carried forward to the conclusion part of the report. It is not clear what is the relevance of these test results, and whether there should be any environmental concern.



## 1.6 QA/QC of Chemical Analysis

Some selected samples were chemically tested for zinc (Zn) and lead (Pb) by both an independent laboratory testing (Accutest Laboratories Limited, Ottawa, Ontario), and by on-site laboratory at the Nanisivik Mine. Table 12 shows both results of the tests, with details included in Appendices E and F.

Are Accutest and on-site laboratory testing methods and procedures the same? What is the significance of "AAS", attached in the description for the zinc, lead and iron concentrations for the on-site laboratory test results?

Table E (p. 45) shows the number of chemical tests which were carried out by on-site laboratory, and by Accutest to determine metal concentrations in the soil and water samples (101 tests for metal by on-site laboratory, and 131 tests by Accutest). Table 12 shows that the test results on similar samples prepared by the two laboratories differ by up to 70 times. As shown in this table, Accutest test results are in some cases higher than the on-site laboratory test results (2 out of 16 tests for zinc, and 6 out of 16 tests for lead). Based on these discrepancies between the two test results, how much confidence does the assessor has in the test results presented in the report? How do these variations affect the evaluation of the test results against the values used in the CCME Guidelines? Do the test results which were reported in Tables 2 to 11 come only from Accutest, or from both on-site and Accutest laboratories?

## 1.7 Surface Water Quality

Taking into account the presence of natural outcrops of massive sulphides in the area, and the earlier studies of the surface water which have been completed since 1974, the following items need to be addressed:

- ▶ What values of metal concentrations in the surface water would be acceptable after the cessation of the mining activities?
- ▶ What values are considered as baseline readings for each metal concentration?
- ▶ Will the baseline readings be used as target values for the long term metal concentrations in the surface water for the area? How will these target readings be achieved in the short term ( during reclamation period) and in the long term?

A summary of observations based on the surface water quality at Nanisivik Mine at the Twin Lakes Creek as discussed in Section 3.3 should also be presented in the conclusion of the report. Comments must also be included in relation to the Kuhulu Lake and Chris Creek, whether the assessor believes that these two bodies of water are or are not areas of environmental concern.

## 1.8 Air Quality Monitoring

Summary of observations which were presented in Section 3.2.4 (pp. 26 and 27) is not presented in the conclusion of the report. On the basis of the test results, are there any concerns of the air quality at Nanisivik Mine? Will additional monitoring be required, expanded, or reduced as a result of the observations?



What were the reasons behind the selection of data collection method (i.e. TRP vs. TSP) for the three sampling locations?

### **1.9 Diesel Contamination Behind the Carpenter Shop**

Figure 5 shows that the locations of all samples (6 test pits and 1 surface sample) collected in the Carpenter shop area are from the north side of the building. Where did the 2000 spill occur? Was the spill area located to the west of the building? The above ground tank is located behind the carpenter shop (west side of the building). Why were there no sampling carried out to confirm that the area surrounding the remediated area is now free from contamination concerns?

### **1.10 Bone Yard Area, Northeast of Industrial Complex**

The report indicates that the bone yard area was not used at the time of the site investigation (p. 51). Only one sample (Sample SS 02-29, shown in Figure 3) was collected. The chemical analysis of sample SS02-29 as shown in Table 4 indicates concentrations of zinc and lead exceeding the CCME Guidelines. What is the historical use of this yard, and is additional sampling and testing required to confirm the test results? Are there any other potential contaminants which may be present in this abandoned yard?

### **1.11 High Lead Concentration in STOL Area**

A soil sample which was collected in the STOL area and tested for metal concentration yielded a relatively high lead concentration (Section 5.3.6, page 69). The lead concentration (9350 mg/kg, Table 7) is the highest encountered during the field investigation and sampling program of the Phase II ESA. This value is approximately 35 times greater than the value established by CCME guideline for commercial land setting.

In view of the above test result, and given that only a single sample was collected and tested for metal concentration for the entire STOL area, is further sampling and testing warranted?

### **1.12 Other Potential Contaminants in the Warehouse Yard and the Material Storage at the Dock**

These two sites have been used to store a variety of chemicals and fuel/oil supplies, from methyl isobutyl carbinol, lime, copper sulphates, to various types of lubricating oils. Nanisivik's Warehouse and Material Storage Plans show the locations where all of these chemicals/supplies are stored in these two sites. Fourteen test pits were excavated in the material storage area at the dock, but only 4 test pits were excavated in the warehouse yard across from the industrial/mill site. Have any screening been carried out during the Phase II ESA field investigation to ensure that there are no potential contamination of these chemicals which may spread into the surrounding area? Did testing of soil and groundwater samples adequately address the potential contamination from these chemicals? Did the four test pits excavated in the warehouse yard adequately address the contaminant concerns for the entire yard?

### **1.13 Table D on Page 47**

It is assumed that this is a typographical error, and is it supposed to be Table E?

## **2. Issues Related to the ERP Report**

### **2.1 Current Information in the ERP Report**

The ERP report should contain the most current information possible, particularly on contact personnel and their phone numbers in case of an emergency. We would like to confirm that the following information has been updated to reflect the current conditions of the Nanisivik Mine, which ceased operation at the end of September 2002.

- ▶ **Section 2 Reporting Procedures**  
Has this section been revised to reflect the current staff at the Nanisivik Mine? How many staff personnel are still living at the mine site? Are there enough staff personnel to cover the various duties described in the response team organization, such as on-scene coordinator, communications officer, health and safety officer, operations coordinator, etc?
- ▶ **Section 6 Response Equipment and Resources**  
Have Tables 6.1 and 6.2 been revised to reflect the current inventory of the mine?
- ▶ **Section 7 Training and Exercising**  
Can it be confirmed that the names of personnel who are listed in Table 7-1 are still working and living at the mine?
- ▶ **Appendix A**  
PCB Storage Contact Information and Authorized Entry List. Some of the personnel listed in this appendix have no longer lived or worked at the mine. A revised information is required for the report.

### **2.2 Tailings Spill Containment**

A small concrete dyke is shown in Figure 3-1, and discussed in Section 3, Page 1 and in Section 5, Page 1. It is assumed that this dyke is intended to contain spills from the tailings system, and to prevent the tailings materials to enter into the Twin Lakes Creek. When was this structure built? What is the size and dimensions, and the foundation of the structure? Is the reservoir (containment area) lined and what capacity does the containment area behind the dyke has?

### **2.3 Marine Spill (Section 13)**

The three spill scenarios described in this section deal with petroleum hydrocarbon spill and contamination. Are there other potential marine spills which need to be addressed in this section, such as potential spills from deliveries of chemical supplies, etc at the dock? What typical materials, other than fuel, are expected to be delivered at the dock after the mine closure in October 2002?

### **2.4 Fuel Tank Decommissioning (Section 14)**

This is an emergency response plan document, and a step by step decommissioning procedure (such as soil sampling, backfilling, and disposal of materials) for the dismantling of fuel storage tanks is not required. However, some paragraphs describing emergency actions during dismantling of the fuel tanks are relevant and should be included in this report.

## **2.5 Missing Figure**

Figure 2-1 is not included in the list of Figures, but it was discussed in Section 2 (Reporting Schedules) of the report as Spill Response Management Structure.

We hope that the above information is adequate for your purpose. Should you have any further questions about this review report, please contact me.

Yours very truly

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NUNAVUT IMALIRIYIN KATIMAYINGI

February 17, 2003

Mr. Robert Carreau  
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*Via Telecopier (506) 548-1100 and Email*

Subject: Licence NWB1NAN0208

Dear Mr. Carreau:

In its letter of January 23, 2003, the Nunavut Water Board ("NWB") approved the timetable of submissions as presented by Breakwater Resources Ltd ("Breakwater"). In that letter, the NWB also proposed to hold a hearing at the end of May, 2003 to discuss those submissions, as well as several other issues related to licence NWB1NAN0208 ("Licence"), such as Breakwater's compliance with the Licence's terms and conditions, particularly with respect to financial security. The NWB invited interested parties to express their views on the NWB's response to Breakwater. The Department of Indian Affairs and Northern Development ("DIAND") was the only party to submit comments to the NWB. DIAND's comments were presented to the NWB for its consideration on February 11, 2003.

DIAND, in its submission, dated February 7, 2003, advised the NWB that conducting a hearing in May, 2003 would be premature and instead suggested that a public hearing be held in Arctic Bay following Breakwater's submission of the final Abandonment and Restoration Plan ("A & R Plan"), which is expected December 15, 2003. DIAND also recommended that the various reports, plans and studies already filed, or to be submitted for NWB approval within the next twelve months, be reviewed and approved following public information sessions with the residents of Arctic Bay. Additionally, DIAND confirmed in their submission that discussions are taking place with Breakwater regarding financial security, and furthermore agreed to file a special compliance report by the end of February, 2003. In its submission, DIAND also offered to meet with the NWB to discuss compliance and enforcement of the terms and conditions of the Licence.

After considering the suggestions outlined in DIAND's submission, the NWB agreed that it would be preferable to hold a public hearing following the submission of the final A & R Plan, due on December 15, 2003. The NWB expects that a public hearing in Arctic Bay would likely take place sometime in February or March, 2004. Concerning the various reports and studies to be filed by Breakwater over the following year, the NWB also agreed with DIAND's

recommendation to review and approve those submissions by way of written hearings that will include community workshops to provide the residents of Arctic Bay with adequate information, as well as encourage their participation in the review and approval of these documents.

On January 20, 2003, Breakwater submitted to the NWB the following reports for approval:

- (1) the Phase II Environmental Site Assessment ("ESA II") required pursuant to Part G, Item 13 of the Licence; and
- (2) the Human Health and Ecological Risk Assessment ("HHERA") required pursuant to Part G, Item 14 of the Licence.

Both reports are available upon request and can be downloaded from the NWB ftp site (<ftp://nwb.vk.com>, in directory "CURRENT HEARINGS/NWB1NAN0208"). Before approving those reports, the NWB would like to give interested parties the opportunity to review them and provide comments. To facilitate their review, the NWB proposes to hold a public information workshop in Arctic Bay during the week of April 14, 2003 (exact date to be confirmed), as well as a technical session in Iqaluit, on or around March 28, 2003, if needed. **The NWB asks interested parties to submit their comments on these two reports before 5:00 mst April 26, 2003** in order to finalize their approval by no later than May 10, 2003.

As for other reports and studies to be submitted by Breakwater over the course of the year, the NWB intends to follow the same process for their approval. The NWB will grant interested parties sufficient time, depending on the complexity of the report, to review and present comments.

Lastly, with respect to DIAND's suggestion to meet with the NWB to discuss compliance and enforcement matters, the NWB is open to such meeting, as long as the meeting is public and the discussions are of a general nature and not specifically about Nanisivik or any other particular licence.

If you have any questions or comments about the proposed process, please contact me or Patrick Duxbury ([nunavutwaterboard@nt.sympatico.ca](mailto:nunavutwaterboard@nt.sympatico.ca)) as soon as possible.

Yours truly,

Philippe di Pizzo  
Chief Administrative Officer

cc. Honorable Robert D. Nault, P.C., M.P.  
Distribution List



April 9, 2003

Mr. Philippe di Pizzo,  
Chief Administrative Officer  
Nunavut Water Board  
P.O. Box 119,  
Gjoa Haven, Nunavut, X0B 1J0  
E-mail:

RE: NTI Comments on Phase II ESA & HHERA reports submitted by Can Zinco.

Dear Mr. di Pizzo:

In response to your letter to Robert Carreau, and the distribution list dated Feb. 17, 2003, Nunavut Tunngavik Incorporated is please to provide it's commentary on the two above mentioned reports. In order to present a factual review of these reports, NTI has commissioned a review of the two reports through a prominent environmental engineering consultant firm. Here we present a summary of the most salient point of the review, however, for the sake of completeness, we submit the reports from the consu'tant as well as a plain language version of these reports. We provide in addition an Inuktitut translation of the plain language report and our submission.

#### REVIEW OF PHASE II ENVIRONMENTAL SITE ASSESSMENT (ESA)

The review of the **ESA** found several deficiencies in the report.

- 1) Document organization:  
The format of the report does not follow the presentation format recommended by the Canadian Standards Association. This leads to difficulty in assessing the report. Details on the organization of the report are found in the review paper.
- 2) In view of the fact that the 1973 B.C. Research Inc. states that "no soil formation has occurred in the mine area", it is difficult to understand the use of CCME soil quality guidelines derived for soil types common to southern Canada. This may put into question the assessment of potential ecological & human health risk base on soil criteria.



- 3) **Contaminants of Concern (COC):**  
Chlorinated Ethenes – Volatile Organic Compounds are identified in Table F as one of the Contaminants of Concern. Its source is listed as constituent of Xanthate. Based on the 12<sup>th</sup> edition Condensed Chemical Dictionary, Chlorinated Ethenes is not a constituent of Xanthate, so the source of these chlorinated Ethenes remains a mystery, yet they are given the same status as a COC as the metals.
- 4) **Areas of environmental concern:**  
In Table G and H, areas of environmental concern identify the distribution of these areas as “Localized”, “small quantities”, and “limited”. This brings into question whether they are overestimated as being “of concern” or underestimated as being “localized”.

Given these shortcomings, the conclusions drawn from the Phase II ESA and the implications for the HHERA needs to be clarified.

#### REVIEW OF ECOLOGICAL RISK ASSESSMENT (ERA)

The review of the ERA found the report to be well organized. The conclusions are conservative as is common for risk assessment. The review finds no serious fault with the conclusions of the ERA. The issues of concern in the review focus on:

- 1) **Focus on Trace element as the Contaminants of Concern** raises the question of why other contaminants, identified in the ESA, are not discussed (Hydrocarbons, etc).
- 2) **Statistical references** are mixed in the section on Surface waters, (arithmetic mean vs. log-normal geometric means)
- 3) **Receptor, exposure & hazard assessment:**  
The effects of snow cover are not assessed or addressed in the exposure discussions.
- 4) **Threshold limits, Assumptions and uncertainties:**  
It is clear that the details used in calculation of limits (100% bio availability, etc) are used to create a worst-case scenario, though some of these are overestimations, and are not current practice. (See details in report).
- 5) **Chemical Interactions:**  
The presence of metallothioneins requires at least some mention.

The review of the Ecological Risk Assessment report concludes that, despite the minor concerns above, this does not affect the accuracy of the conclusions reached.





## REVIEW OF HUMAN HEALTH RISK ASSESSMENT (HHRA)

The review of the HHRA has identified several items that need clarification. However, overall, the review does not believe that the lack of clarity of the items detracts from the correctness of the conclusions of the HHRA. The issues of concern are identified in the review documents provided as background to this summary.

### GENERAL CONCERNS WITH THE PHASE II ESA AND HHERA

The conclusions of the review carried out by NTI has identified several issues with the reports that should be clarified, however, overall these issue do not render the conclusions of the Phase II ESA and HHERA incorrect.

However, several issues and concerns come out of the general review of the reports. These are summarized below:

- 1) The use of the 1985 Soil Geochemical Survey data as representative of baseline conditions is questionable. These data are presented as representing conditions prior to wind blown dispersion of metals from dry tailings; however, the potential for other sources of metals (Mining activity in general, etc.) is not accounted for.
- 2) The results of the Phase II ESA & HHERA in determining Soil Quality Remediation Objectives (SQRO) define a threshold of 12,000 mg/kg (ppm) Zinc as acceptable, , for a site that is to have potential Human Habitation (Nanisivik Town Site) as a future use. This is in contrast with a similar evaluation at the Polaris mine were threshold for a region that is expected to have little or no use in the future has thresholds of 10,000 mg/kg Zinc. When comparing the General Mine Area SQRO for Nanisivik with Polaris, the difference is greater (Lead mg/kg 3,500 Nanisivik vs. 2,000 Polaris; Zinc mg/kg, 39,000 Nanisivik vs. 12,000 Polaris). These differences seem inappropriate considering the proposed future uses of the two sites.





## GENERAL COMMENTS ON THE EMERGENCY RESPONSE PLAN

Though no outside review of the emergency response plan was undertaken as part of the NTL review, some general observations have been made. These mostly reflect the need to update the plans contact information and chain of command to reflect the current and future manpower availability on site.

These issues were addressed in detail in the technical meeting held in Iqaluit, Nunavut on March 29, 2003.

These general concerns, along with the specific concerns in the review reports, need to be addressed by the authors of the Phase II ESA and HHERA reports. Nunavut Tunngavik Inc. hopes that the board will consider our concerns when deciding on the status of these reports.

Sincerely

Stefan B. Lopatka  
Senior Advisor,  
Environmental, Water & Marine Management  
Lands and Resources Department  
NUNAVUT TUNNGAVIK INC.







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