2003 Phase 3 Environmental Site Assessment
Nanisivik Mine, Nunavut

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CanZinco Ltd.

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Gartner Lee Limited

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February 3, 2004

Mr. Robert Carreau
Corporate Manager, Environmental Affairs
Breakwater Resources Limited
Suite 2000, 95 Wellington Street East
Toronto, ON M5J 2N7

Dear Mr. Carreau:

Re: 23635 – Nanisivik Mine, Phase 3 Environmental Site Assessment Report

We are pleased to submit this report on the Phase 3 Environmental Site Assessment at the Nanisivik mine in hard copy and electronic formats.

In addition to documenting and reporting on the Phase 3 activities, the report also contains individual responses to each of the conditions placed on the Nunavut Water Board's approval of the Phase 2 ESA Report.

We trust that this is satisfactory and that you will find the information presented in this report to be complete and thorough. In our consideration, this work completes the needs for environmental site assessment at the Nanisivik mine.

Yours very truly,
GARTNER LEE LIMITED

Arlene Laudrum, P.Geol.
Senior Environmental Geologist

AL:gc

(23635 RPT Ph 3 ESA 21-Jan-2004.doc)

Sperling Plaza, 6400 Roberts Street, Suite 490, Burnaby, BC, V5G 4C9 tel 604.299.4144 fax 604.299.1455
Toronto | Vancouver | Calgary | Montreal | St. Catharines | Whitehorse | Yellowknife | Bracebridge
www.gartnerlee.com

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Introduction

The Nanisivik Mine, located on the south shore of Strathcona Sound near the community of Arctic Bay in the North Baffin region, produced lead and zinc mineral concentrates from 1976 to 2002. The mine was permanently shut down in 2002 due to depleted ore reserves and poor economic forecasts.

As part of the closure and reclamation planning process, CanZinco Ltd., the mine owner, commissioned an Environmental Site Assessment ("ESA") to identify the nature and distribution of contaminants in soil. A Phase 2 ESA was undertaken in July 2002 by Gartner Lee Limited ("Gartner Lee"). Conditional approval was given by the NWB for the Phase 2 ESA Report based on fulfillment of 15 specified conditions regarding information requests and requests for clarifications. Each of those conditions is addressed herein.

A Phase 3 ESA investigation was conducted in August 2003 that incorporated as many of the comments that were brought forward through the NWB review of the Phase 2 ESA Report as allowed by timelines and practicalities. The Phase 3 ESA investigations are reported on herein.

A total of 267 soil samples were collected from 90 test pits during the Phase 3 ESA. Additionally, 15 water samples were collected from groundwater monitors and surface seeps. Analyses for metals and petroleum hydrocarbon concentrations were conducted at an accredited laboratory for a select subset of the soil samples and all of the water samples.

The work performed for the Phase 3 investigations is considered to complete the needs for preparation of a remedial plan for the Nanisivik site and no further ESA investigations are deemed necessary.

Conclusions

The conclusions drawn from Phase 3 program, as presented herein in Section 5, are provided below.

Dock Area

- The downgradient extent of hydrocarbon contaminated soil at the fuel tank farm has been delineated. Testing has shown that it does not extend beyond 40 m from the berm of the tank farm.

- Concentrations of hydrocarbons in the soil within the dock cell containing the ship loader facility exceed the generic PHC CWS IL for the protection of aquatic life, the site soil quality remediation objective.
- Surficial hydrocarbon contamination is present at the AST adjacent to the refuge station. The contamination appears to be isolated to the immediate area surrounding the AST.
- Hydrocarbon contamination was detected in a test pit which exposed the fuel line from the dock to the tank farm. Results indicate that contamination is localized and has migrated less than 40 cm from the line.
- Zinc concentrations greater than the SQRO for the dock area have been identified on surface, adjacent to the door to the concentrate shed on the west side, at the load out dock and adjacent to the refuge station. One isolated incidence is documented on the east side of the concentrate shed. Lead concentrations also exceed the SQRO adjacent to the door of the concentrate shed on the west side. No lead or zinc contamination greater than the SQROs is indicated in the reagent storage area. Analytical results indicate that the metal contaminated soil does not extend to 0.4 m below surface.
- Silver exceeds the generic CEQG IL, the site soil quality remediation objective. Elevated silver results were returned in samples with zinc concentrations that were indicative of zinc concentrate and several times greater than the SQRO and, therefore, silver contamination would be remediated during the remediation of the zinc contaminated soils.

STOL Airstrip

- Hydrocarbon contaminated soil detected during the Phase 2 ESA at the east end of the airstrip has been delineated. The contaminated soil does not extend 45 m from the point of origin as indicated by surface staining. Hydrocarbon contaminated seepage water was encountered in test pit TP03-373, however, soil quality results from this test pit met the PHC CWS RL criteria. Test pit TP03-373 was excavated approximately 45 m from the point of origin.
- Lead concentrations greater than the SQRO detected during the Phase 2 ESA on the apron on the south side of the airstrip were investigated. The lead contamination has been delineated vertically and laterally and it is confined to the soils on surface at the apron.

Town, Carpenter Shop

- The downgradient extent of hydrocarbon contaminated soil at the Carpenter Shop has been delineated. It does not extend 50 m downgradient of the building. No impact of hydrocarbon contamination on the surface water was detected in the water flowing in a ditch adjacent to the Carpenter Shop.

Industrial Complex/Warehouse Yard

Industrial complex

- Soils beneath the surface water runoff pathway, downgradient of the fuel day tanks, are contaminated with hydrocarbons. Contamination did not extend to 0.95 m beneath surface at test pit TP03-331, but was present at 1.5 m below surface at the upgradient test pit TP02-88.
- Hydrocarbon contaminated soil has been delineated at the waste oil tank, located between Twin Lakes Creek and the industrial complex. Results indicate that it is isolated to the downhill side of the tank and does not extend to the creek.
- Hydrocarbon contaminated soil is present at the oil water separator. Analytical results obtained from test pit TP03-330 indicated that the contaminated soil does not extend 50 m downgradient of the oil water separator.
- Metal contaminated soil is present in the soil surrounding the industrial complex. Analytical results to date indicate that concentrations of cadmium, lead and zinc greater than the SQROs do not generally extend to 0.4 m below surface.

Warehouse Yard

- Hydrocarbon contamination is present in surficial soils with patchy, visible staining. Hydrocarbon contamination at an area of heavy staining (initially identified and sampled during the Phase 2 ESA) extends into the fractured bedrock to at least 0.8 m depth. It does not extend into the weathered, fractured bedrock, encountered 0.4 m, beneath lightly stained surface soils.

Landfarm Cell

- Based on analytical results obtained to date, it is estimated that approximately 25% of the hydrocarbon contaminated soil being remediated in the landfarm cell at the landfill currently meets the generic PHC CWS RL criteria.

Landfill

- No hydrocarbon contamination was detected in soil or water samples down gradient or cross gradient of the landfill and all analyses were less than the method detection limits.
- No elevated metals were encountered in the soils.

K-Baseline

- Hydrocarbon contamination of soil has been detected at the former AST and maintenance shop at K-Baseline. Analytical results from test pits excavated northwest of the former AST and maintenance shop indicated that the contaminated soil does not extend to the intermittent tributary of Chris Creek.
- Analytical results from the Phase 3 ESA illustrate that the hydrocarbon contaminated soil is isolated to the top of the active layer.

Roads

- Surficial hydrocarbon contamination is present at the ASTs adjacent to the refuge stations at the side of the roadways. The contamination appears to be isolated to the immediate area surrounding the ASTs.
- Metal contamination of soil is present adjacent to the former Oceanview mine workings.
- Iron contaminated soil is present on the surface of the roadway between the townsite and the industrial complex at the west side of bridge near the sewage treatment plant. The contamination did not extend to 0.4 m below surface.
- Metal contaminated soil is present on the surface of the roadway between the industrial complex and the screening plant, located approximately 1.5 km to the north. The contamination did not extend to 0.4 m below surface and was not detected in soils adjacent to the roadway.

1. Introduction

The Nanisivik Mine, located on the south shore of Strathcona Sound near the community of Arctic Bay in the North Baffin region, produced lead and zinc mineral concentrates from 1976 to 2002. The mine was permanently shut down in 2002 due to depleted ore reserves and poor economic forecasts. Sulphide ore was mined at a nominal rate of 2,200 tonnes per day predominantly by underground methods and from several small satellite open pits. The mine is owned by CanZinco Ltd., a wholly owned subsidiary of Breakwater Resources Limited ("CanZinco").

As part of the closure and reclamation planning process, CanZinco commissioned an Environmental Site Assessment ("ESA") to identify the nature and distribution of contaminants in soil. A Phase 2 ESA was undertaken in July 2002 by Gartner Lee Limited ("Gartner Lee").

Water License NWB1NAN0208 dated October 1, 2002 (the "Water License"), issued by the Nunavut Water Board ("NWB") to CanZinco, requires submission, for approval by the NWB, of a report on the 2002 Phase 2 ESA program (clause G.13). A report on the 2002 Phase 2 investigations was submitted to the NWB by CanZinco/Gartner Lee in January 2003 (the "Phase 2 ESA Report") and, after a review by the NWB that incorporated technical review from a number of government and community agencies, conditional approval was given on August 22, 2003, based on fulfillment of 15 specified conditions regarding information requests and requests for clarifications.

Upon completion of the 2002 Phase 2 ESA investigations, CanZinco prepared plans for follow up investigations that would take place during summer 2003. The preparation timeframe was such that many of the comments that were brought forward through the NWB review of the Phase 2 ESA Report were considered in the design of the 2003 follow up program. Ultimately, a Phase 3 ESA investigation was conducted in August 2003.

This report, the 2003 Phase 3 ESA Report, documents and reports on the 2003 Phase 3 investigations. It also addresses each of the 15 conditions specified by the NWB in its conditional approval of the Phase 2 ESA Report. This report also references and brings forward relevant information but does not repeat all of the information provided in the Phase 2 ESA Report. Electronic copies of this report contain the Phase 2 ESA Report in its entirety as Appendix A.

The Canadian Council of Ministers of the Environment ("CCME") Guidelines for ESA are a generally recognized industry protocol that defines the fundamental purpose of the ESA process as providing the information necessary for preparation of a site remediation plan. Preparation of the remediation plan is not a part of the ESA process. These guidelines and definitions were followed for the Nanisivik 2002 Phase 2 and 2003 Phase 3 ESA investigations.

2. Summary, Review and Conditional Approval of 2002 Phase 2 ESA

2.1 Summary of Phase 2 ESA

An Executive Summary was prepared for the Phase 2 ESA Report that is repeated below in its entirety for context leading into the discussion of the responses to the terms of the conditional approval and the 2003 Phase 3 activities. The entire Phase 2 ESA Report is appended, as Appendix A, to electronic copies of this report.

Executive Summary (Repeated from the Phase 2 ESA Report)

A Phase II Environmental Site Assessment ("ESA") of the Nanisivik mine site and associated mine-owned facilities (owned by CanZinco Ltd.) was conducted in July 2002 according to protocols published in Federal guidelines and according to a scope of work that incorporated regulatory and community comments.

The scope of work for the field investigation included: review of existing information: sampling of soil on surface and at depth in test pits that were typically excavated to hard frozen ground; installation of seepage sampling wells in test pits that accumulated water; visual mapping and sampling of rock types in road beds; visual mapping and sampling of sediments and waste rock in Twin Lakes Creek; chemical analyses for various metals, hydrocarbons and other relevant parameters; data analysis; and reporting.

The existing information that was reviewed and that is summarized in this report includes:

- widespread geochemical analyses of surface soils;
- dust monitoring data;
- acid rock drainage analyses;
- metals in marine sediments;
- metal loading studies in Twin Lakes Creek; and
- a survey of metal concentrations in surficial soils in the town conducted by others for the Government of Nunavut, which was incorporated with the permission of the Government of Nunavut.

The 2002 ESA field investigation program resulted in:

- the excavation of 147 test pits and the installation of seepage sampling wells in 8 of the test pits;
- the collection of 59 surficial soil samples;
- the collection of 9 sediment samples;
- sampling of 2 surface seeps and the eight seepage sampling wells;
- measuring the organic vapour concentrations in soil; and
- the submission of soil, sediment and water samples for petroleum hydrocarbon (PHC) and metals analysis.

All of the known or suspected areas of potential environmental concern were investigated, which included: the landfill, the industrial complex area, the dock area, the roads to Oceanview, Area14 and the dock, wind blown tailings, the town, the East Adit treatment facility, the tailings pipeline route, Twin Lakes Creek and current or former fuel dispensing locations.

An Ecological and Human Health Risk Assessment was initiated in September 2002 by CanZinco Ltd. that will identify the most sensitive contaminants and receptors and recommend appropriate "Tier 3" site specific soil quality remediation objectives. The information provided in this ESA report will be directly relevant to that study. However, in the absence of those specific soil quality remediation objectives at this time, this report compares analytical results to generic "Tier 1" Federal guidelines for parkland and commercial land use as a means of providing some context for reviewing the data and assessing contaminants and areas of environmental concern.

Based on observations and results obtained during the Phase II ESA, the contaminants listed in the table below are considered to be of environmental concern. The Phase II ESA did not identify Ethylene glycol (antifreeze) and arsenic as contaminants of environmental concern.

Contaminants of Environmental Concern

Contaminant	Comment
Volatile Petroleum Hydrocarbons	Constituents of gasoline (<C10); identified by elevated concentrations of Canada Wide Standards for Petroleum Hydrocarbons ("PHC CWS") fraction F1 and benzene, ethylbenzene, toluene and xylene ("BETX") compounds.
Extractable Petroleum Hydrocarbons	Constituents of diesel, oils and greases (>C10); identified by elevated concentrations of PHC CWS fractions 2, 3 and 4.
Naphthalene	Constituent of diesel.
Chlorinated Ethenes – Volatile Organic Compounds	Constituents of Xanthate.
Cadmium, Copper, Lead, Zinc	Constituents of ore, concentrate and tailings.

Areas of Environmental Concern that were identified or verified by this Phase II ESA are illustrated on the following summary figure and listed in the two tables below for hydrocarbons and metals. These tables also present summary comments regarding the extent or nature of the environmental concern for each area.

Areas of Environmental Concern - Hydrocarbons

Area	Comment
a. Oceanview	Localized near surface contamination at an existing, small above ground storage tank ("AST"). Localized contamination to permafrost at a former, larger AST.
b. K-Baseline	Contamination to permafrost at one former AST and at former maintenance shop that extends downgradient.
c. East Adit Area	Localized near surface contamination at a small AST. Contamination to permafrost at one current AST at 39N dump.
d. 17N Refuge Station	Localized near surface contamination at an existing small AST.
e. Area14	Localized near surface contamination at a former AST.
f. West Adit Area	Localized near surface contamination at AST's at the ANFO building and 01 portal. Contamination adjacent a former underground storage tank ("UST').
g. Town	Hydrocarbon contamination at ASTs adjacent the homes is confined to shallow areas (less than 0.05 m) indicated by visual surface staining. Hydrocarbon impacted soil at larger ASTs is not readily detectable by visual observations due to resurfacing of the ground surrounding the tanks with shale fill and the vertical extent of contamination can extend to permafrost and could extend laterally.
h. Carpenter Shop	Contamination to permafrost downgradient of area remediated after 2000 diesel spill.

Area	Comment
i. Land Farm	No soil or water contamination downgradient of landfill area. Soil in landfarm continues to require remediation.
j. STOL Airstrip	Localized contamination at former AST.
k. Industrial Complex Area	Contamination to permafrost in maintenance and parking areas. Contamination to permafrost downgradient of fuel storage area. Localized near surface contamination at waste oil tank and warehouse yard.
l. Dock Area	Localized near surface contamination at a current AST. Limited contaminant migration at the permafrost horizon downgradient of the fuel pump building does not extend to within 50 m of the ocean shore.

Areas of Environmental Concern - Metals

Area	Comment
1. Oceanview	Small quantities of mineralized rock along road side.
2. K-Baseline	Limited exposed mineralized rock in yard at portal.
3. East Adit Area	Waste rock dumps, open pits and exposed mineralized wall rock.
4. East Adit Treatment Facility	Residual treatment sediments in Treatment and Retention ponds. Localized surficial contamination in drainage paths.
5. Area14	Limited exposed mineralized rock in yard at portal.
6. Area14 Road	Small quantities of mineralized rock along roadside.
7. Tailings Pipeline/Dump Ponds	Residual tailings at former pipeline breaks.
8. West Adit Area	Waste rock dumps, open pits, exposed mineralized wall rock and natural outcrops in Twin Lakes Creek.
9. Twin Lakes Creek	Waste rock dumps and natural outcrops in contact with creek.
10. Wind Dispersed Tailings	Tailings are present as a very thin surficial coating on rocks and soil in a northwesterly direction and along the base of the hill on the south side of the town.
11. Town	Elevated metal concentrations in surficial soil.
12. Industrial Complex Area	General contamination of area. Concentrations decrease at depths greater than approx. 0.5 m.
13. Concentrate Haul Road	General contamination of roadfill. Surficial contamination of upper soil horizon along roadside.
14. Dock Area	General surficial contamination of area.

2.2 NWB Review and Conditional Approval of the Phase 2 ESA Report

Subsequent to submission of the Phase 2 ESA Report to the NWB in January 2003, the NWB held two "rounds" of review comments with responses being provided by CanZinco/Gartner Lee for each set of comments. The Nanisivik Water License explicitly requires approval of the ESA Report by the NWB (NWB1NAN0208, Section G.13) and, subsequent to the two rounds of review and response, the NWB provided a conditional approval of the Phase 2 ESA Report. There were 15 conditions attached to the approval that were in the form of requests for clarifications or additional information.

In its response to the second round of review comments dated June 16, 2003, CanZinco/Gartner Lee suggested that it would be more efficient and beneficial to all of the parties involved to have the responses to the reviewer's requests incorporated into the 2003 Phase 3 ESA Report, rather than resubmitting a revised Phase 2 ESA Report. This would avoid an inefficient use of time and would allow the results of the planned Phase 3 ESA investigations to be directly brought into the responses.

In this way, each of the 15 conditions placed on approval of the Phase 2 ESA Report are listed and responded to herein in Section 2.3.

2.3 Responses to NWB Terms, Conditions and Clarifications for Approval of the Phase 2 ESA Report

Sections 2.3.1 through 2.3.15 provide individual responses to each of the NWB's conditions for approval of the Phase 2 ESA Report. In each of these sections, the NWB condition is quoted (NWB, August 22, 2003) and a response is provided.

2.3.1 Documentation

That CanZinco incorporate all pertinent documentation and correspondence generated from the Phase II ESA review process, in addition to any new information developed from the 2003 sampling study. A full list of references and supporting documents should be presented in the forthcoming ESA.

Appendix B contains a complete record of documentation pertaining to the NWB's review of the Phase 2 ESA. This specifically includes all publicly posted review comments from all parties, comments from the NWB and CanZinco/Gartner Lee responses to the NWB. There have been no direct communications between CanZinco/Gartner Lee and any parties other than the NWB.

New information that has been generated from the 2003 Phase 3 ESA sampling program is described fully herein in Section 4.

A list of references is provided herein in Section 6.

2.3.2 1985 Soil Geochemistry Survey

That CanZinco include, as a dedicated chapter in the forthcoming ESA, a comprehensive discussion of the 1985 Soil Geochemistry Survey for Nanisivik. This chapter should include the following: a description of the soil sampling, soil analytical and QA\QC methodologies employed in the study; the survey's historic purpose in relation to mining activity at Nanisivik; the rationale for using the survey data in the ESA as opposed to applying other existing or surrogate data sets; a discussion of how mining activity prior to 1985 does, or does not, affect the utility of the data for the purposes of developing Soil Quality Remedial Objectives.

An expanded rationale regarding the use of the 1985 Soil Geochemistry Data in the Phase 2 ESA Report was initially provided to the NWB by CanZinco/Gartner Lee in two responses to review comments dated May 19, 2003 and June 16, 2003. That rationale has been reviewed and expanded on below. The rationale is also supplemented by a comprehensive discussion provided herein in Section 3.2.

The 1985 soil data is an important source of information that is directly relevant to both the ESA process and the Human Health and Ecological Risk Assessment (HHERA) process that was conducted by Jacques Whitford Environment Limited (JWEL). Further, it is both appropriate and beneficial that the data was used in these processes.

The purpose of including the 1985 soil data in the ESA process is to provide a complete description of the environment that makes use of all of the available information. One of the important uses of the 1985 soil data is to complement past and current observations and mapping of natural mineralized exposures in and around the mine area. For example, the identification of a naturally mineralized area to the general northeast of the town site is based, primarily, on past and current observations and geological mapping and this first hand information is complemented and supported by the 1985 data.

The 1985 soil data were used as one component of the calculations of the site-specific soil quality remediation objectives (SQROs) as described in the HHERA report prepared by JWEL (JWEL, 2003a). It is our understanding that the sensitivity of the end results (i.e., the SQROs) to the 1985 soil data is relatively small; that is, that the 1985 data play a relatively minor role in the calculations. It is also our understanding that, were the 1985 soil data found to be skewed high in soil metal concentrations, this would have the effect of reducing the calculated SQROs. This is because the higher soil metal

concentrations would provide an artificially high "background" intake which would, in turn, reduce the allowable additional intake. This adds a degree of conservatism into the SQRO calculations.

In our view and in general, the availability of site-specific data for closure planning (including the calculation of SQROs) increases confidence in the plan and increases the validity of the plan as compared to other sites where generic data must be used.

It is always important that the limitations of any source of technical information be documented and understood to ensure that the data is used appropriately. In the case of the 1985 soil data, we feel that the limitations of the data have been well documented in the Phase 2 ESA Report and in the May 19, 2003 and June 16, 2003 responses to review comments that are included herein in Appendix B. Further detail is provided herein in Section 3.2. However, these limitations should not be taken as negating the benefits of employing the data as reliable, site-specific information that generally enhances the validity of the closure planning process.

The use of "surrogate" data (transposed from a separate, similar location) can be considered in circumstances where no site-specific information exists or where the existing site-specific information does not suit the needs of the project. It is our view that the 1985 soil data is appropriate for use at Nansivik, with due consideration of its limitations, and that there is no benefit to the closure planning process in attempting to transpose remote data from another location.

2.3.3 Contaminants of Concern

That CanZinco, in the discussion of Contaminants of Concern at Nanisivik, include a full rationale for excluding PCBs, PAHs, chlorinated ethenes, mine process chemicals and nitrogen compounds from its list of contaminants.

As is standard practice for ESA's in Canada, the CCME procedural protocols and the CCME Guidelines for soil quality were used as the basis for the Phase 2 and Phase 3 ESA's of the Nanisivik site. Good practice also requires that other potential contaminants of concern, besides those listed in the CCME guidance documents, be considered to ensure that the overall mandate of conducting an ESA (i.e., to identify contaminants of environmental concern) is achieved.

A rationale regarding the approach to investigation of the specific contaminants identified by the NWB was initially provided to the NWB by CanZinco/Gartner Lee in a response to review comments dated May 19, 2003 that is included herein in Appendix B. That rationale has been reviewed and expanded on below.

PCB's

Electrical equipment containing PCB's was historically used at the mine site and there is currently an approved PCB storage container at the mine site.

PCB concentrations in soil were not specifically investigated as part of the ESA process because, primarily, the available information did not indicate any previous spills to soils of PCB-containing oils from in-service equipment or the storage container. The spills database (Appendix C) includes one reported release of PCB-containing oil (2 L) in the underground compressor room on January 27, 1993. This release was completely contained within the underground mine and the spilled product and transformer in question were placed into the PCB storage container as part of the response activities.

Therefore, in the context of the ESA process, there was no indicated need or benefit to testing for PCB concentrations in soil samples in the absence of any indications of areas of contamination.

Polycyclic Aromatic Hydrocarbons (PAH's)

Naphthalene and some other PAHs are sometimes present as trace constituents of diesel fuel. The presence of diesel contaminated soil can be effectively detected by analyzing for extractable petroleum hydrocarbons in soil. The *Canada Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (PHC CWS)*, (CCME 2001) were utilized during both the Phase 2 and Phase 3 ESA investigations for the identification of diesel contamination. Results of the 2002 Phase 2 ESA (Tables 3, 4 and 8 of the Phase 2 ESA Report) included an assessment of PAHs in soil. The results showed that when PHC CWS Fraction 2 (C_{10}-C_{16}) were 1,130 µg/g and greater than the guideline for surface soils for Residential/Parkland land use (450 µg/g), the PAH results were less than the method detection limits. When the Fraction 2 concentration was 7,080 µg/g, the naphthalene concentration was 1.1 µg/g and the other PAH parameters remained below the method detection limits. These results indicate that naphthalene concentrations greater than the CEQG objective for Residential/Parkland land use (0.1 µg/g) are present in soil with Fraction 2 concentrations several orders of magnitude greater than the PHC CWS objective for Residential/Parkland land use.

Therefore, naphthalene is considered to be a contaminant of environmental concern at the Nanisivik mine site where the PHC CWS Fraction 2 concentration is several orders of magnitude higher than the CEQG for Residential/Parkland land use. In these locations, the high concentrations of the Fraction 2 will trigger a remedial response such that any naphthalene that may be present will be remediated in concert with the Fraction 2 contaminated soil. There is no indication or rationale to suspect that soil contaminated with naphthalene, or other PAH's, are present elsewhere on the mine site.

Mine Process Chemicals (including Chlorinated Ethenes)

CanZinco's February 2002 Closure Plan described mine process chemicals as follows:

Chemicals used in the mill as process reagents are as follows:

1. Lime (2,300 g/t) is used to modify the ground ore so pyrite (iron sulphide) particles are not recovered in the marketable concentrates.
2. Xanthate (100 g/t) is used in the flotation circuits to coat the selective particles (galena or sphalerite) so that they are recovered in the flotation process.
3. Methyl Isobutyl Carbinol (MIBC) (3 g/t) is used to stabilize the air bubbles (froth) in the flotation circuit so that the recoverable mineral will float.
4. Copper Sulphate (500 g/t) is used to activate the surface of a sphalerite particle so that it can be floated and recovered in the zinc circuit.

The reagents are shipped to the site by ocean freighter and transferred to land for outdoor storage. The mill reagents are stored outside in a designated area adjacent to the concentrate storage shed. The reagents are transported to the mill in weekly allotments and are mixed/dispensed from a specific area in the mill where all spills are collected in a designated sump for subsequent reuse in the milling operation.

Lime was the process chemical that was used in the greatest quantity but is not considered a contaminant of potential concern given its alkaline nature and that no large exposed stockpiles are present.

Chlorinated ethenes were initially identified in the Phase 2 ESA report as a potential contaminant of concern based on their assumed presence in xanthate. Review comments on the Phase 2 ESA Report provided by NTI/AMEC via the NWB suggested that it may not be appropriate to list chlorinated ethenes on the summary table of contaminants of concern. We have reviewed the Material Safety Data Sheet provided with this product and determined that chlorinated ethenes are not present. Therefore, we agree with this suggestion and this revision been incorporated into this Phase 3 ESA Report.

MIBC was used in relatively small quantities and was handled in areas that were being investigated as part of the ESA programs. MIBC is a volatile compound and therefore it tends to dissipate rapidly with time. Trace amounts of MIBC that may be present in the reagent storage area can reasonably be considered to be identified in concert with other indicators of contaminants that were handled in greater quantities such as copper.

Copper Sulphate was used in substantial quantities and was indirectly investigated by analysis of soil samples for metals.

Nitrogen Compounds

Compounds of nitrogen such as ammonia, nitrites and nitrates are not included in the CCME (1999) guidelines for soil or sediment quality. These compounds can be of concern for the protection of water