Teck

February 11, 2009

Nunavut Water Board
Box 119
Gjoa Haven, NU
X0B 0J0
Attention: Phyllis Beaulieu, Manager of Licensing

Indian and Northern Affairs Canada
P.O. Box 100
Iqaluit, Nunavut
X0A 0H0
Attention: Spencer Dewar, Manager, Lands Administration

Dear Phyllis and Spencer;

Re: Polaris Mine Water Licence NWB1POL0311 – Updated 2004 Water Licence and Decommissioning and Reclamation Plan Reports

Please find enclosed with this letter the requested updated Polaris Mine 2004 Decommissioning and Reclamation Plan Report.

This report was previously submitted in electronic form in only as at that time it was missing some data and reports that had not been completed. Subsequently, the remaining data and reports have been completed and the 2004 report has now been updated to complete the reporting of the 2004 reclamation work, monitoring and studies. The translation of an executive summary into Inuktitut is not included with this report as the translator we use is travelling at the moment. I will email the translation once I have received it which will likely arrive before the reports which are being sent by Canada Post.

I have enclosed paper copies of this report in addition to an electronic copy (in pdf format). Please note that due to the quantity of information contained in the report, it is being submitted in two volumes (Volumes 1 & 2).

If there are any questions regarding the materials presented, please contact me and I will be pleased to assist in anyway that I can.

Yours truly,

Bruce J. Donald
Reclamation Manager
Environment and Corporate Affairs
Teck Cominco Limited

Enclosures – Volumes 1 & 2 of the February 2009 Revision to the 2004 Polaris Mine Combined Quarterly and Annual Report

POLARIS MINE

DECOMMISSIONING AND RECLAMATION ACTIVITIES

2004 REVISED COMBINED QUARTERLY AND ANNUAL REPORTS

SUBMITTED TO

THE NUNAVUT WATER BOARD

AND TO THE

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS CANADA

February 11, 2009

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1. EXECUTIVE SUMMARY IN INUKTITUT

Refer to Appendix 1 for an executive summary of plans, reports and studies conducted under this licence during the period January 1, 2004 to December 31, 2004 that has been translated into Inuktitut.

2. INTRODUCTION

The Polaris Decommissioning and Reclamation Plan (DRP) dated March 2001 received its initial conditional approval April 15, 2002. The Closure Plan was jointly conditionally approved by the Nunavut Water Board ('NWB') and the Department of Indian and Northern Affairs Canada ('INAC'). The Closure Plan has subsequently received further approvals. The approvals contain reporting requirements and this document has been prepared to consolidate all of the reporting requirements into one document. This report is required by both NWB and INAC on a quarterly basis with an annual report due by March 31st of the subsequent year. This is the fifth report related to the decommissioning, reclamation and monitoring of the Polaris Mine since closure. It combines the annual reporting requirements not previously reported for 2003 as well as all of the reclamation and monitoring activities that occurred during 2004.

This report was originally submitted in September 2005 in electronic form and at that time was missing some required sections. Subsequently, the report has been completed and is now being re-submitted in both paper and electronic form.

As-built drawings are required by the DRP approvals for a number of engineered reclamation works, including:

- The Operational Landfill cap,
- The Little Red Dog Quarry Landfill construction and cap,
- The sealing of the four mine entrance portals,
- The removal of the deep sea dock and the re-contouring of adjacent foreshore areas, and
- The decommissioning of Garrow dam.

Originally, the prime contractor doing the decommissioning work at the site was contracted to provide the as-built drawings for reporting purposes. The first set of drawings presented to us were of the Operational Landfill. Upon close checking of the drawings provided it became clear that the cap was completed without an adequate survey of conditions before the capping began. The contractor relied on fill stakes rather than a survey to verify the completed cap thickness. To verify the cap thickness was adequate, Teck Cominco had a series of test pits dug to confirm the cap thickness. Teck Cominco then contracted Gartner Lee Ltd. to undertake the remaining surveys and to re-do some of the initial surveys to provide reliable information for this and other areas. After completion of the work at site, this information was then used by Teck Cominco to prepare the as-built drawings. As there was no professional geotechnical engineer located continuously onsite throughout the long period of time that all of the work was underway, we were not able to obtain a formal sealing of these drawings by a professional engineer. However, our project staff located on site did monitor the work and ensure that subsequent work was adequately surveyed as reclamation work proceeded.

3. UNAUTHORIZED DISCHARGES AND SUMMARY OF FOLLOW UP ACTIONS

3.1. Garrow Lake Effluent Discharge

A single grab sample of effluent taken on July 7th, 2004 from the Final Discharge Point of Garrow Lake had a Total Suspended Solids (TSS) level of 117 mg/L which exceed the TSS limits of both the Water Licence and the Metal Mining Effluent Regulations (MMER). Concurrently with taking this sample, the monthly characterization which includes an acute lethality samples were also collected. There was no acute toxicity of either the Rainbow Trout or the Daphnia magna (i.e. LC50s in both cases were > 100% effluent). All of the metals concentrations were within Water Licence and MMER limits. It is apparent that the TSS was the result of high flows in the newly re-established Garrow Creek channel and not a reflection of the water quality within Garrow Lake itself. All subsequent water samples from the Final Discharge Point were compliant for the remainder of the discharge season. A copy of the letter submitted to Environment Canada and their response are included in Appendix 2.

3.2. Hydrocarbon Spills

- During planned clean up of known hydrocarbon contaminated soils in the under Foldaway #1, liquid petroleum was encountered. Approximately 400 litres of hydrocarbon were recovered by pumping it into barrels. The oil was then stored on site until it was incinerated in the on-site hydrocarbon incineration system. While this was in accordance with the DRP, Environment Canada requested that this be reported to the Spill Line, which was done (refer to file note in Appendix 2). As this was in an area of known hydrocarbon contamination, the surrounding contaminated soils were excavated as planned. Gartner Lee Ltd. (GLL) conducted confirmation testing to document that the remediation efforts were successful. Their report on this area is included site "Contaminated Soil Remediation 2004 Close-Out Reports" included in Appendix 5.
- On June 10th, 2004 a hydrocarbon spill was identified. A 205 liter oil drum had been punctured during snow clearing operations. The spill was reported to the N.W.T. Spill Line. The spill was immediately cleaned up and a Gartner Lee Ltd. representative directed the remedial activities and the subsequent confirmatory sampling. As this was a minor spill, it is included in this report in Appendix 2 rather than as part of the more comprehensive site environmental close out reports.
- In March of 2003, a fuel line leaked in the area of the Accommodation complex utilidor. Sampling of the area was conducted confirming that soils had been contaminated by the fuel but remediation of this area was deferred until remediation planned for the area in the DRP was conducted. In the summer of 2004, the contaminated soil was excavated and confirmatory sampling was conducted by Gartner Lee Ltd. confirming the remediation of the area had been successfully completed. Their technical memorandum reporting on the test results is included in Appendix 2.

4. STATUS OF AUTHORIZATIONS AND/OR APPROVALS

Authorizations and/or approvals granted during 2004 were as follows:

1. Request to place metals contaminated soils into Little Red Dog Quarry Landfill ("LRDQL") and additional hydrocarbon contaminated soils underground in the mine workings was approved on February 9, 2004.
2. Request for Modification of Haulage Location (Garrow Lake dam core material into the barge excavation) dated October 15, 2004.
   - Approved March 5, 2004.
3. Letter of Direction regarding the Cover Cap Design for Little Red Dog Quarry. The letter identified technical information to be supplied to INAC and the NWB as part of the design.
4. Letter of Approval for decommissioning the Garrow Lake wavebreak structure was issued July 8, 2004. The letter requires that visual observations be completed during low flows at the end of the summer to confirm that the channel is not obstructed and that a survey of the wavebreak structure is completed.

5. DECOMMISSIONING AND RECLAMATION PROGRESS REPORT

Reclamation activities were at relatively low levels during the beginning of the year due to the end of the Christmas period and the continuation of the cold, dark period of the arctic winter. Maintenance activities increase in advance of other site activities to prepare for the coming construction season.

Manpower levels were as follows:

	Peak	Minimum
January	58	20
February	73	58
March	77	61
April	119	77
May	131	121
June	128	113
July	121	97
August	73	24
September	20	0

5.1. Building Demolition

5.1.1. Mill / Offices / Warehouse Facilities / Barge

- At the beginning of the year, demolition of the barge was 98% complete with only the barge loading ramp remaining intact. In the first quarter, burial of barge hull sections placed into Little Red Dog Quarry Landfill (LRDQL) was accomplished using metals contaminated soils. The final portion of the barge (the loading ramp), was demolished and disposed of in July. Refer to Appendix 3 for photographs.

5.1.2. Cat Generator Building

- After demolition of the main power generation system in the Barge in 2003, site power was supplied by the Cat Generators in a building located to the west of the former barge area. As a result, excavations of contaminated soils had to occur around this facility until it was finally demolished in June 2004. At this time a

portable generator system was used to supply power to the Accommodations Complex. Once the Cat Generator Building was demolished, clean up of contaminated soils under the building was completed. Refer to Appendix 3 for photographs of the facility.

5.1.3. Concentrate Storage Building

- At the beginning of the year, demolition was 98% complete with only a few footing remaining in place. This was completed during the summer and the area re-graded. Refer to Appendix 3 for photographs of demolition and site contouring.

5.1.4. Accommodations Complex

- The Accommodations Complex was in use until the beginning of August when a reduced crew size permitted relocation to a temporary camp utilizing former exploration camp trailers, converted storage trailers, converted sea containers and tents. Refer to Appendix 3 for photographs of the Accommodations Complex being demolished and the subsequent contouring of the site. Along with the demolition of the Accommodations Complex, the service corridors were also removed. A photograph of the temporary camp is also included in Appendix 3.

5.1.5. Fuel Tank Farm

- This was one of the final facilities to be demolished as fuel was required through to the end of the project. In March fuel from one of the two main storage tanks was transferred into the other tank. Once the first tank was empty, it was cleaned and demolished. The second main tank was demolished in August only after a portable fuel storage bladder was set up. Recontouring of the Fuel Tank Farm area was one of the last activities on site continuing until a few days before the site was abandoned in September. Refer to Appendix 3 for photographs of the demolition and of the temporary fuel bladder. During the September INAC and Water Board inspection of the site, this was one of the areas identified as requiring additional re-sloping due to the steepness of the fill remaining in the area.

5.1.6. Incinerator Building

- The Incinerator Building was a temporary structure build specifically to house the custom fabricated incinerator for the reclamation project. The incinerator was used in 2003 and shut down through the early part of 2004. It was restarted in May to complete the incineration process of the waste hydrocarbons. Any hydrocarbons on site at the end of the project were removed from the island for incineration and/or recycling. Demolition of the building occurred in August. The incinerator was salvaged for future use in the north. Refer to Appendix 3 for photographs of the facility and re-contouring of the site after demolition of the building.

5.1.7. Foldaway Buildings

- There were 3 metal buildings located south of the Concentrate Storage Building along the shoreline. These were used for storage and some maintenance activities during operations and reclamation. Excavation of contaminated soils surrounding these buildings was initiated in May and the buildings were demolished in June. Photographs of this are included in Appendix 3.

5.1.8. Fire Hall

- The Fire Hall area continued to be used as a fire hall and emergency training facility through until May. At that time a tent was constructed to house the fire truck once the building demolition began. Refer to Appendix 3 for photographs of this area.

5.1.9. Fresh Water System

- The Fresh Water System was one of the last services systems to be demolished. Once the reduced crews moved to the temporary camp and demolition began on the Accommodations Complex, the pump house and fresh water pipeline were removed after filling the water reservoir. In late August, the reservoir was finally demolished and water was trucked from Frustration Lake for the final days of the project. Refer to Appendix 3 for photographs.

5.1.10. Mine Portals

- There were four portals allowing access underground. They were the Main Portal, the Conveyor Portal (CV03), the Exploration Portal and the North Portal. Once haulage of contaminated soils was completed the portals had concrete seals constructed within the mine openings (at a location deep enough that the overlying strata were at least twice as thick as the drift height). Appendix 3 has photographs of each of these as the sealing activities proceeded. Final contouring of the ground surface makes the locations of these hard to identify now that it has been completed.

5.1.11. Temporary Dock

- The former Temporary Dock consisted of several I Beam piles that remained just off the foreshore by the Foldaway Buildings in several feet of water. Early in 2004 while the sea ice was at its thickest, these were cut-off by excavating through the sea ice to the base of the I Beams.

5.2. Earthworks

Earthworks were the major challenge of the project due to the volume of materials to be moved and the difficulty of working during the dark, cold portion of the winter. While many photographs of the work have been taken, the photographs are of limited value in allowing the reader to visualize the success of the work. The best method of assessing the recontouring efforts is site visits where detailed inspections can be conducted. Appendix 3 contains photographs of key areas of the work as it progressed during 2004.

5.2.1. Marine Dock and Adjacent Shoreline

- Starting in early April, a crew of divers was mobilized to cut off the sheet piles as part of the decommissioning of the marine dock. A second crew of divers was mobilized in May due to slow progress. Removal of the piles was completed in May while the ocean was still covered by the ice pack.
- In the area of the dock and barge, extensive work was done to ensure the remediated areas were gently sloped in accordance with the Westmar designs.
- During 2003 much of the recontouring of the adjacent south foreshore area had been undertaken with a berm left intact along the foreshore. In 2004 the last phase of the recontouring of the foreshore was to remove the berms. This was done while the ocean was still ice covered.

- More extensive recontouring work was required on the north shoreline area due to the amount of fill that was in these areas. Only some of this work had been conducted during 2003 so the majority of the recontouring work had to be completed during the 2004 construction season.
- Work along the foreshore was completed before the ice pack cleared in the summer. By the end of August, the action of ice being pushed onto the shore through the summer season had already started to naturalize the appearance of the beach. Refer to Appendix 3 for photographs of the work.
- Detailed surveys of this area have been completed and two as-built drawings of the decommissioned dock and foreshore area are attached in Appendix 4. The drawings are titled 'Polaris Mine Closure – Decommissioning of Dock As Built Drawing Plan View' (Drawing Nbr. PM 2005 Dock 1 of 2) and 'Polaris Mine Closure – Decommissioning of Dock As Built Drawing Section Views' (Drawing Nbr. PM 2005 Dock 2 of 2)

5.2.2. Barge and Adjacent Area

- The majority of the barge excavation was completed in 2003. Excavation of hydrocarbon contaminated soils continued as a focus of work between the dock and the Cat Generator Building, and to the north of this area were the focus of work during the first 6 months of 2004.
- During backfilling of the barge excavation, materials from the decommissioning of Garrow Lake dam were hauled and placed into the barge excavation. Appendix 4 has a drawing of the barge excavation showing the location where the dam fill material was placed.

5.2.3. Garrow Lake Dam

- Work on decommissioning the Garrow Lake Dam occurred primarily in March and April 2004 while there was no flow in the creek. Excavation of the dam materials went smoothly. One blast was required to remove the dam material. The rest of the dam material was excavated using a ripper. For the one blast, non-ammonia type explosives were used. As required by DFO, vibration monitoring in Garrow Lake was conducted but the vibrations were so low that the monitoring device wouldn't record the readings. Once the centre of the dam was removed and the creek channel prepared, geotextile and rip-rap were placed into the channel during April (Refer to photographs in Appendix 3).
- Detailed surveys of this area at the end of construction have been completed and Appendix 4 contains the as-built drawing titled 'Polaris Mine, Nunavut Garrow Lake Decommissioning; As Built Drawings Plan and Section Views; Drawing Nbr. PM 2006 G-DAM 1 of 1'.

5.2.4. Garrow Lake Wavebreak Structure

- During the early winter of 2004, using surveyor guidance to locate the former creek channel, remnants of the wavebreak structure were removed down to native materials in the creek channel to ensure that there were no blockages of the channel. Additionally, the top of the wavebreak structure visible above ice level was lowered to minimize the visual impact of the structure.
- The wavebreak was surveyed after the mine ceased production by Focus Engineering as part of the bathymetric survey of Garrow Lake. However a more

detailed, updated survey is required (note – refer to plan of detailed survey in the 3rd Quarter 2006 Nunavut Water Board Report).

- This area will be inspected each year as part of the annual geotechnical inspection.

5.2.5. Operational Landfill

- The 1.8 metre thick cap on the Operational Landfill was completed in 2004. During the June 20th to 22nd 2004 inspection by INAC, it was noted that the surface materials in some areas of the cap had been segregated during construction so that materials on the top surface of the landfill were too course while materials on one area of the face of the landfill appeared too fine. Subsequent to the inspection, a layer of finer material was placed over the coarse rock on the top cap of the landfill and additional coarse rock was placed on the face of the landfill in the areas identified as being too fine. Completion of this repair was noted by INAC in its September 9th, 2004 site inspection.
- New thermistors were purchased with closer spacing of the temperature monitoring bulbs at the top of each string (for more detailed monitoring of temperatures within the active zone of the cap). However, in September when contractors demobilized from the site, the new thermistors had not been installed. The thermistors will be installed in the summer of 2005 when crews return to site.
- Detailed surveys of the landfill were done at all key stages of construction and the locations of the thermistors. The as-built drawing is included in Appendix 4 and is titled 'Polaris Mine, Nunavut; As-Built Topographic Plan Operational Landfill Site; Drawing Nbr. PM 2005 OLF 1 of 1'.

5.2.6. Little Red Dog Quarry Landfill ('LRDQL')

- At the end of 2003, the last major debris from the Barge hull had been cut up and placed in LRDQL for burial.
- Drilling and blasting on the upper areas of the limestone quarry continued through until August to produce adequate materials for the landfill cap.
- On February 9th, 2004 INAC and NWB approved the placement of metals contaminated soils into LRDQL. This material was used as infill material to complete burial of the barge hull debris as well as other debris generated in 2004.
- During 2004, 80,300 cu.m. of metals contaminated soils were disposed of in LRDQL. The capacity of LRDQL was adequate to dispose of the contaminated soils below the limestone bedrock surrounding the quarry. The elevation of the notch in LRDQL was slightly lowered to properly tie in with the design of the landfill cap. This is to ensure that any precipitation can drain out of the quarry without pooling on the cap.
- The thermistor pipes installed while the landfill was being constructed all survived. The new thermistors designed with closer spacing of the temperature monitoring bulbs (for more detailed monitoring of temperatures within the active zone of the cap) had been received. As completion of the cap for LRDQL was one of the last tasks to be completed on site, there was no time to install the monitoring thermistors before crews left site in September. The thermistors will be installed in the summer of 2005 when crews return to site.
- Detailed surveys of this are were done at all key stages of construction of the construction of the cap. Refer to Appendix 4 for a copy of the as-built plan titled

'Polaris Mine Closure; Little Red Dog Quarry Landfill As-Built Drawing Plan and Sections; 1 of 1'.

5.2.7. Back 40 Area (Including CRF Area, New Quarry, North Pit, Subsidence Area, North Portal Area)

- Contouring of the pit walls in the New Quarry area had been completed in 2003. During 2004 additional fill was excavated from the quarry for use throughout the site. These areas were re-graded upon completion. However, in September 2004 some additional material was excavated from the New Quarry to place over an area in the Reclamation Landfill where test pitting indicated some debris was covered by less than 2 metres of fill. This area of excavation in the quarry was not re-sloped at the end of work season. During the September 2004 INAC site inspection, this deficiency was identified. The resloping of this localized over steepened slope will be undertaken when equipment operators are next mobilized to site, currently expected to be in 2006.
- Extensive re-contouring in the CRF area, the North Portal area and north of the Subsidence area was competed during 2004.

5.2.8. Roadways

- Recontouring of roadway shoulders was ongoing through most of the summer construction season. In areas where the roads had steeper slopes, they were re-sloped. In late August and the first week of September, culverts in all of the roads were removed to allow natural drainage patterns to be restored. Additionally, areas where water flowing along side road shoulders was being concentrated, water bars were installed. These areas will be the inspected as part of the annual geotechnical monitoring program to ensure that these areas are stable from erosion.

5.3. Contaminated Soil Remediation

5.3.1. Concentrate Storage Shed and Area

- Completed in 2003. A technical memorandum from A. Laudrum, P.Geol. of Gartner Lee Ltd. comments on residual contamination remaining and the capping of this area (end of Appendix 9).

5.3.2. Cemented Rock Fill (CRF) Plant Area

- Previously completed.

5.3.3. Former Quonset Huts Fuel Storage Area

- Previously completed.

5.3.4. Tailings Thickener Building and Area

- Previously completed

5.3.5. Former Fuel Bladder Storage Area

- Previously completed.

5.3.6. Former Crusher Area

- Previously completed.

5.3.7. Main Snow Dump

- Previously completed.

5.3.8. North Portal Ore Stockpile

- Previously completed.

5.3.9. Exploration Waste Dump / Stockpile Area and Shoreline North of Dock

- Previously completed.

5.3.10. June 2002 Oil Spill Area

- Previously completed.

5.3.11. Marine Dock and Adjacent Foreshore Areas (South Shore and North Shore)

- Extensive work removing contaminated soils in the dock was ongoing through most of the construction season and was successfully completed in 2004. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.12. Barge Area

- Extensive work removing contaminated soils in the area of the Barge and Cat Generator Building continued from early in 2004 through until June. Contamination in this area was more extensive than anticipated. Initially the assumption was that contamination that occurred during operations would be limited by permafrost. However it now appears that substantial contamination occurred during the construction phase of the project when there were more excavations in the area resulting in contamination being found in areas much deeper than anticipated. This resulted in the volumes of contaminated soils increasing substantially over planned volumes. Remediation was successfully completed in this area. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.13. Accommodations Area

- As part of the ESA, an area of concern related to hydrocarbon contamination around the fuel tank located at the north east corner of the Accommodations Complex was identified. Remedial excavations started on July 5, 2004 prior to demolition of the building but final investigations and remediation had to wait until the building was demolished to access underneath it. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.14. Foldaway Buildings (3)

- Excavation of contaminated soils was commissioned in May in areas surrounding the buildings. The buildings were demolished in June and excavations of contaminated soils continued through June and were completed in July. Remediation of the hydrocarbon contamination of this area was successful. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.15. Fuel Tank Farm and Lube Storage Areas

- The Fuel Tank Farm was located within a bermed and lined area. In 2002 there was a significant oil spill in an area adjacent to the Fuel Tank Farm which was the subject of a major remedial project and has been previously reported.
- The Lube Storage area located adjacent to the Tank Farm was identified in the 1999 and 2000 ESA investigations as having both metals and hydrocarbon contamination. Additional investigations in the Lube Storage area were conducted in both 2003 and 2004 to outline the boundaries of the contamination. Remediation of these areas was initiated May 1, 2004 and was completed

successfully on August 30, 2004. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.16. Tailings Pipelines

- The Tailings Pipelines (2) extended from the process facilities located at the Barge complex to the Thickener Building near Garrow Lake. The Tailings Thickener Building area was remediated in 2003 and the results previously reported. The 1999 and 2000 ESA of the Tailings Pipeline route documented a number of spills that had occurred during operations. These spills had been reported by the mine and immediate clean-up of the spills had been undertaken. However, the spills had been cleaned up without the benefit of guidance by environmental sampling. As a result, residual contamination remained and these were cleaned up during 2003 and 2004. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.17. Loon Lake Snow Dump

- This snow dump was identified in the 1999 and 2000 ESA as an area of potential metals contamination. Sampling at the time identified one sample exceeding remedial objectives for lead but none for zinc. Additional field investigations were undertaken in 2003 indicating that remediation was required for this area. Prior to remedial excavations occurring, the snow dump had to be melted by spreading it out. Excavation of contaminated soils commenced June 10th and was successfully completed on August 8th 2004. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.18. Fire Hall Area

- The 1999 and 2000 ESA identified this as an area of concern for both metals and hydrocarbon contamination. In 2003 additional delineation drilling was done and excavation of contaminated soils was initiated on July 2003. Work continued until September 2003 and was discontinued at that time due to interference from buildings and roads that were still in use. In late April 2004 and continuing through until early July, excavation of contaminated soils continued until confirmatory sampling indicated that the areas of contamination had been successfully remediated. Refer to the Gartner Lee Ltd. "Contaminated Soil Remediation 2004 Close Out Reports" in Appendix 5.

5.3.19. Other Areas

- There were a number of other area identified in the 1999 and 2000 ESA as being areas potentially having contaminated soils or other concerns. These included:
- Construction Landfill – this area was relocated to become part of the Operational Landfill and capped
- Fire Training Area – this area was identified as an area of potential concern prior to the development of site specific remedial objectives (SRQs). Subsequent review of sample data indicated that the area met the SRQs and therefore no remedial work was undertaken in this area.
- Explosives Storage / Detonator Storage Area - this was identified due to the storage of dangerous materials (explosives) which have subsequently been removed.
- Surface Above the Active Mining Area – this was identified as an area of potential concern due to the subsidence of the ground surface over the

underground mine workings. This was discussed earlier in this report and is also addressed in Section 10.1.

5.4. Disposal of Hazardous Materials / Special Wastes

5.4.1. Waste Hydrocarbon Incineration

- At the end of 2003 a stock of waste hydrocarbon substances was stored on site. In May on-site incineration was re-started to destroy the remaining hydrocarbon liquid wastes. Any hydrocarbon wastes remaining at the end of the project were shipped off site for recycling and/or incineration.

INCINERATOR
INCINERATION OF WASTES BY MONTH - 2004

	Imp. GALLONS		LITERS	
2004	WASTES	FUEL	WASTES	FUEL
JAN				
FEB				
MAR				
APR				
MAY	2,655	313	12,070	1,424
JUN	11,772	2,862	53,515	13,009
JUL	3,904	1,156	17,750	5,254
AUG				
SEP				
YTD TOTALS	18,331	4,331	83,335	19,687
TOTAL BURNT	22,662		103,023	

5.4.2. Confirmation That Fluorescent Light Ballasts Did Not Contain PCB's

- While the mine was constructed after the date when PCB's in electrical equipment had been banned by Federal legislation, GLL still conducted inspections of records, interviewed key maintenance personnel and checked manufacturing dates on transformers. While the testing that confirmed the absence of PCB's in the transformer oils, there was no formal documentation in the ESA stating that fluorescent light ballasts did not contain PCB's. As a result, GLL prepared a technical memorandum verifying that they had conducted the interviews and that a range of fluorescent fixtures had their manufacturing dates checked to confirm that there were no PCB's in the fluorescent light ballasts. The memorandum is contained in Appendix 6.

5.4.3. Shipping of Chemicals and/or Hazardous Waste Materials

- At the end of the project when personnel and equipment were demobilized from the site, the remaining chemicals and hazardous wastes were shipped out on the sea lift. These materials included:
    - Waste oils
    - Waste batteries (drained)
    - Waste battery acid

- Various waste gases
- Waste aerosol tins,
- Waste Freon
- Waste Halon

These materials were transported by Desgagnes to Ste-Catherine, Ontario where it was received by Buckham Transport and delivered to Bennett – MRRI (a registered environmental disposal company) in Cornwall, Ontario for disposal or recycling.

6. PROJECT COST ESTIMATE UPDATE

Appendix 7 contains the cost for the work completed to year end 2004 representing the virtual completion of the reclamation phase of the Decommissioning and Reclamation Plan (DRP).

In summary, total DRP costs to the end of the decommissioning and reclamation portion of the project plus the future monitoring costs were $69,264,000.

Major departures from the original budget were primarily due to the following:

- under estimating the quantities of contaminated soils,
- under estimating manpower and supply costs for equipment maintenance
- travel costs both due to higher than forecast airfares and increased usage due to the increased manpower levels.
- Contractor indirects were higher than forecast partially due to increase volume of work.

7. RECLAMATION SECURITY REQUIREMENTS

As is noted in a number of sections of this report, there are some technical reports and as-built drawings outstanding at this time. In addition, the documentation to rationalize the legal names between permits, licenses and leases is also outstanding. When these outstanding items are submitted, they will be accompanied by a request to reduce security being held by INAC and the NWB to levels more representative of current reclamation liabilities of the site.

8. PUBLIC CONSULTATION / PARTICIPATION

At this stage of the reclamation process there was little public consultation as the planning and execution of the plan was nearing the last 8 months of the project.

Inuit employment was primarily through participation of Qikiqtaaluk Corporation (QC) who was responsible for the majority of the earth moving on the project. Teck Cominco ensured that GLL utilized at least one Inuit assistant for environmental monitoring through most of the work season. As earthmoving activities were seasonal, Inuit content of the work varied each month and is listed below:

- January 2
- February 3

- March 1
- April 5
- May 15
- June 14
- July 12
- August 4
- September 0

Upon demobilizing from the site, a number of sea containers were loaded primarily with furniture and office materials for delivery and distribution in Resolute Bay.

9. FRESHWATER USE

Freshwater use from Frustration Lake for all uses during 2004 was:

MONTH	Volume (M^3)
January	19,526
February	20,222
March	20,679
April	18,107
May	26,669
June	19,132
July	19,647
August	727
September – December	0
Total for 2004	**144,708**
Quantity Licensed for 2004	**200,000**

Water use in August was low despite having up to 73 people on site as the water reservoir was full so that pumping of water from Frustration Lake was minimal. The system is now demolished so that reporting of water use will cease now that the site is normally vacant except for a few people during site inspections.

10. PHYSICAL MONITORING OF SITE

10.1. Summary of Work Done In Response to Inspection Compliance Reports

There were two site inspections by INAC and/or the Water Board during 2004. The first inspection was conducted from June 20, 2004 to June 22, 2004. A letter from the Water Board and INAC dated July 21, 2004 identified the following issues identified during the inspection to be responded to:

- Garrow Lake Dam

TCL agreed to re-grade some of the soft soils observed at the downstream side of the former dam. This was undertaken in August. There are also some areas on the upstream side of the dam that have snow mixed in with soils and appear to require additional grading. As the majority of this area is thought to be made up primarily of snow and not soils, it will be necessary to review this area once the snow has melted which will be in

2005 at the earliest. Monitoring of the dam slopes will be part of the annual geotechnical inspection of the site.

- Subsidence Zone

TCL was to initiate monitoring of the subsidence zone using a GPS system. This has been done using a GPS system that is accurate within centimeters. In August 2004 a detailed survey of the subsidence area was conducted. Contours of this area were drawn by Focus Engineering and are included in Appendix 8 of this report. The drawing also includes a number of cross sections comparing the 2003 survey results to the 2004 survey results. The only significant change between the two surveys was caused by the re-grading and smoothing of some isolated features in 2004.

TCL was to submit a geotechnical review of the Subsidence Area by the Golder Associates. TCL has made a number of attempts to have Golder Associates review this area and comment on the expected future ground surface behavior. To adequately do this review, extensive review of information regarding timing of mining, dimensions of the stopes developed, quantities and locations of backfill placed into completed underground mine of stopes are all details that would be required to provide an informed opinion. As this information had not been expected to be required in the future, at the time that the mine closed, most of these records were not retained. As a result, given the lack of independent geotechnical review of the subsidence concern, TCL committed to conduct annual topographic survey to identify if there is any measurable subsidence occurring and if so, what are the trends in terms rates of subsidence.

If necessary, TCL would implement long-term, post closure mitigation measures that would protect the safety of wildlife and the public. If filling an area of subsidence was not a practical solution (due to continuing instability or the quantity of fill required), a more practical contingency could simply consist of fencing the active subsidence area. While not the preferred solution, if subsidence were to be a significant risk, then this could be the most practical solution.

TCL was requested to conduct test pitting in the Reclamation Landfill area to confirm that debris is at least 2 metres below the surface. TCL did this in August and found a limited area where there was thinner cover. As discussed in the first paragraph of this section, additional fill was placed on top of this area to ensure at least 2 metres of cover is in place.

- Operational Landfill

The June inspection identified that the top cover on the Operational Landfill was too coarse. During placement of the cover materials, the use of dozers to spread the fill resulted in segregation of the cover materials in some areas. TCL added an additional 300mm (approximate) thick lift of finer material to the top of the landfill to provide a more graded cover. Additionally, although not noted in the inspection report, on the face of the landfill, there was an area where the finer materials that segregated from the coarse materials had been placed. A lift of coarser cap materials was added to this area resolving the concern.

- Product Storage Area

TCL was to prepare a letter more fully explaining the area of residual metals contamination at the Product Storage area to confirm that there is no risk of exceeding remedial targets if migration of the contamination were to occur. This technical memorandum was outstanding at the time of the original submission of this report but has subsequently been included in Appendix 9. The technical memorandum is from A. Laudrum, P.Geol., Gartner Lee Ltd. and while states that the cover is robust to demonstrate that migration is not happening that annual sampling is done during routine inspections of the site. This sampling will be reported in the routine 3rd Qtr. site monitoring reports.

TCL had requested that one more site inspection be conducted prior to completion of the reclamation and decommissioning work. A second inspection occurred on September 9th, 2004 which was shortly after the contractor had demobilized from site. On November 8th, 2004 a report of the site inspection by BGC Engineering was submitted to the NWB. No formal response from the NWB or INAC was received by TCL during 2004. TCL has the following comments to make with regard to the recommendations contained in BGC's report:

- BGC recommends that the following areas undergo further re-sloping:
  a) Below where the incinerator building, the tank farm, and the exploration portal were located.
     - This will be done but will be coordinated with other earth moving requirements that may become apparent over the next year or two at the site.
- Blade down the crest of the slope above the main portal.
  - Some minor re-sloping will be done here at the same time as the previous items.
- Remove reinforcing steel from above the Main Portal and Exploration Portals
  - This will be done over the next few years as final clean-up of the site proceeds.
- Remove scrap metal from the surface from reclaimed areas for safety and aesthetic reasons.
  - This will be done starting in the summer of 2005.
- Remove piles of snow from the upslope areas of Garrow Dam as they thaw.
  - Will be done as the snow melts and if required. Will be reviewed in the summer of 2005.
- Report on the subsidence assessment by Golder Associates.
  - As reported previously, Teck Cominco has been unsuccessful in obtaining an assessment from Golder Associates and so has committed to conducting an annual subsidence survey to demonstrate that ground surface movements in the area of concern either not occurring or are minor and reducing in rate.
- Report on the analysis of the rusty coloured soils in the drained area of Garrow Lake.
  - During the 2004 studies being conducted by Azimuth Consulting group of the Garrow Lake and Garrow Creek areas, rusty coloured sediments were observed in the drained area of Garrow Lake between the lake and the former dam. Patrick Allard of Azimuth took a typical sample of the material on

August 26, 2004 and submitted it to ALS laboratories for analysis. Appendix 17 has the laboratory analysis of this soil (Labeled "G Lake"). The zinc concentration of the soil was 1160 mg/L which was well below the site specific remedial soil objectives for the site.

- Provide As-Built Drawings for the Sealing of the Mine Portals
  - All four mine portals were plugged and sealed in conformance with the approved construction drawings. The drawings have been completed to the approval stage and are attached in Appendix 4.
- Provide As-Built Drawings for Little Red Dog Quarry
  - Detailed surveys of the placement of debris, metals contaminated soils, the cover cap, and the locations of the thermistor pipes have been done. The as-built drawings are included in Appendix 4.
- Install Thermistors and Data Loggers in the Operational and Little Red Dog Quarry Landfills
  - New thermistors with closer spacing of thermistors (to more accurately monitor the landfill cap area), have been purchased. They will be installed in the summer of 2005 when personnel return to site. Data loggers are being considered but in 2005 it is expected that personnel will be at the site on a regular basis to read the thermistors during the summer months.
- Monitor Outflow Through the Wavebreak at Garrow Lake for Erosion
  - This will become a part of the annual geotechnical inspection of the site starting in 2005.
- Monitor the Stability of the Marine Foreshore
  - This will become a part of the annual geotechnical inspection of the site starting in 2005.
- Forward Remaining Contaminated Soil Close Out Reports
  - These are included in Appendix 5 of this report.

10.2. Disposal of Demolition Debris and Contaminated Soils

10.2.1. Disposal of Demolition Debris Into Little Red Dog Quarry Landfill

Refer to Appendix 10 for a listing of general descriptions of the types of demolition debris transported to LRDQL during the year along with a photographic log. Also included in Appendix 10 are drawings of the locations within LRDQL that the debris was placed.

During 2004, metals contaminated soils were placed into LRDQL as well. The as-build drawing of LRDQL in Appendix 4 identifies the locations that these soils were placed.

The approval to dispose of metals contaminated soils in LRDQ Landfill specified that if there was any drainage from the quarry, that it be sampled to confirm that the run off does not contain excessive metals. During the spring freshet and the warm months of July, the fills within LRDQ Landfill were below the lip of the quarry pit so that there was no run-off from the landfill materials (including metals contaminated soils) as they were all contained within the pit. In late August when the final cap was being placed, there was no run off to sample. It is important to note that the top of the metals contaminated

soil layer at the end of the project was still at a lower elevation that the lip of the limestone quarry. The final cap (1.8m minimum thickness) was graded as per the approved design drawings to gradually slope towards the notch in the pit so any surface run-off will flow out of the quarry area.

10.2.2. Disposal of Metals / Hydrocarbon Contaminated Soils Underground in the Mine

As noted earlier in the report, on February 9th, 2004 approval was granted to dispose of metals contaminated soils in LRDQ Landfill so that the remaining space in the underground workings could be reserved for the hydrocarbon contaminated soils. Appendix 11 contains a reconciliation of the total tonnes of contaminated materials excavated and their location of disposal by type of contamination (metals contaminated, hydrocarbon contaminated or co-contaminated by both metals and hydrocarbons) soils. By the end of the project, most of the readily available space within the mine had been filled.

Appendix 11 includes the mine level plans indicating the locations that contaminated soils were stored. These plans are complete to the end of the project and represent the conditions as they were when the mine portals were sealed.

10.3. Thermistor Data

10.3.1. Garrow Lake Dam

Siphoning of Garrow Lake was completed in the 3rd Quarter of 2003. Removal of the dam commenced so that the thermistors in the dam have been decommissioned so there is no temperature data to be reported.

10.3.2. Operational Landfill

Capping of the landfill was completed in 2004 but the new thermistors were not installed at the time contractors demobilized from the site in September. In the summer of 2005 when crews return to site, the existing thermistors will be removed and the new thermistors purchased will be installed.

10.3.3. Little Red Dog Quarry Landfill

Completion of the cap on LRDQ Landfill occurred right at the end of the project, just before contractors demobilized from site n September 2004. When crews return to site in 2005, the new thermistor strings custom manufactured for this area will be installed.

10.3.4. Rock Temperatures Surrounding Mine Workings

As part of the approvals for TCL to store additional hydrocarbon contaminated soils in the mine workings, TCL was requested to provide additional ground temperature information surrounding the mine workings. A series of mine plans are presented in Appendix 12 that indicates the rock temperatures 3 metres into the adjacent the walls of the underground tunnels. Thermometers were inserted into existing drill holes for several hours until they stabilized. While these temperatures may not be precise, they do give confidence that the rock temperatures are sufficient to maintain the materials in a frozen state.

10.4. Erosion Monitoring

10.4.1. Garrow Lake Erosion Monitoring

There was no sign of any erosion either through visual inspection or through the monitoring of the erosion pins. It should be noted that these pins are now some distance from the edge of the lake as the shoreline becomes re-exposed as the elevation of the lake decreased during the past few years of siphoning. Weather conditions prevented obtaining readings in June and September as the pins were buried in snow. Measurements and photographs were obtained in both July and August.

The results of the 2004 monitoring are presented in Appendix 13. Measurements confirmed that there have been no significant changes from the previous year.

10.4.2. Garrow Creek Erosion Monitoring

Three erosion monitoring pins were placed in Garrow Creek to monitor during the initial season of flow in Garrow Creek now that the dam has been decommissioned. Appendix 14 contains:

- Photographs of the three erosion monitor pins in Garrow Creek and the measurements taken to track potential erosion of the creek bed. The pins were installed on July 16th. It was not possible to install them sooner due to the high flows in the creek early in July. Measurements of the distance from the top of the pins to the creek bed were done weekly until flow essentially ceased for the year.
- TSS sample results taken weekly through the period of flow in the creek.
- Weekly photographs of the creek from three static locations
- Photographs of the creek every 100m along its length near the end of the season documenting conditions at the end of the discharge season.

Initially once flow started in the creek in early July, flows were higher than anticipated as the lake had not been siphoned down in the fall of 2003 as low as desired. Some erosion of the creek bed occurred as a result. The July 6th TSS sampled indicated this (TSS was 117 mg/L) and the exceedance was reported to Environment Canada (refer to Section 3.1 above). An acute toxicity sample was also collected at the same time as the TSS sample which confirmed that the TSS exceedance was not acutely toxic to either rainbow Trout or Daphnia magna. An analysis of metals in the creek water confirmed that the TSS consisted of native materials and did not contain significant tailings (i.e. zinc and lead concentrations were within permit levels). The peak flows lasted a couple of days and near the end of July, the outlet channel of the lake was plugged to reduce the amount of water flowing in the creek and it was removed once the lake had completed its annual discharge cycle. TSS levels were acceptable at all times other than the July 6th exceedance.

10.4.3. Marine Dock and Adjacent Foreshore Monitoring

During decommissioning of the dock and adjacent foreshore areas, monitoring of the foreshore area was conducted by Gartner Lee Ltd. Monitoring included daily sampling and analysis of TSS when work was actively occurring along the foreshore. If TSS exceeded approved limit of 25 mg/L above background, then work was stopped until further preventative measures could be taken to control TSS levels. On a weekly basis, a

series of photographs were taken at a series of pre-selected locations approximately 200 metres apart along the active work area. The TSS results and weekly photographs are presented in Appendix 15. Once work on the dock and foreshore was completed, in July 2004 Azimuth Consulting Group coordinated an intertidal and subtidal survey of the dock and foreshore area as required by the DFO Authorization for the work. A towed underwater video camera referred to as a SeaBed Imagery and Mapping System (SIMS) was used to collect the video images of the sea bottom. Their report titled "Intertidal and Subtidal Photographic Survey – Former Dock Area, Polaris Mine" is included in Appendix 16. In addition, Appendix 16 contains three DVD's. Two of the DVD's depict the SIMS imagery used to develop the report and the third DVD depicts subtidal biota from a SCUBA survey.

10.4.4. Frustration Lake Pier Monitoring

The approvals for decommissioning the freshwater system require annual testing of the water of Frustration Lake during open water for Total Suspended Solids (TSS). Appendix 17 contains the sample results taken on September 3, 2004. TSS was 3.3 mg/L.

10.5. ANNUAL GEOTECHNICAL INSPECTION

Mark Watson of EBA Engineering conducted the annual geotechnical inspection of the Polaris Mine site between August 25th and August 28th of 2004. During the inspection, efforts were made to identify potential future locations of erosion so that future geotechnical inspections could monitor those locations. Inspections also included Garrow Lake Dam, the Operational Landfill, the marine foreshore and Little Red Dog Quarry Landfill. A final version of the inspection report was never completed.

10.6. SUBSIDENCE AREA STABILITY

There was no visible change in the contours of the Subsidence Area in the summer of 2004 relative to the previous summer. During 2004, some fill was added to part of the area over the Reclamation Landfill to thicken the cover over debris. Some of this material was obtained by dozing material from adjacent areas, and also by hauling in fill from the New Quarry. At the end of this work a detailed GPS survey of the Subsidence Area was conducted to monitor the surface contours. The contour plan prepared by Focus Engineering contains cross sectional drawings showing the elevations as they existed in 2003 and again after the 2004 work was completed. Areas where the cut and fill activities occurred in 2004 are apparent on this drawing (Appendix 8). It is apparent from this drawing that no significant subsidence of this area occurred between 2003 and 2004.

In 2004, Golder Associates were requested to review the issue of the subsidence area and to provide their view of the future stability of this area. While discussions of the issue were held, it did not result in a formal report adequate for submission. The thorough review of this matter requires a detailed knowledge of the site, the timing of mining and of details of back filling (including timing, volumes, sequences), volumes of backfill relative to the stope volumes, configuration mine workings, and an understanding of the local geology. While Golder was the geotechnical consultant during operations that made annual site inspections to review the geotechnical status of the mine, many of the detailed records necessary to do the

requested review were no longer available after mine closure. Due to the lack of success in obtaining a geotechnical opinion of the stability of the area, Teck Cominco has committed to conducting a detailed annual topographic survey of the area to monitor:

- Whether or not there is measureable active subsidence, and if so,
- The location of the activity, and the change of rate of subsidence over time.

The results of the subsidence survey will be submitted annually with the 3rd Quarter site inspection reports. Additionally, this area will be included in the annual geotechnical inspection of the site for an independent comment on the significance of any subsidence observed.

11. GARROW LAKE STRATIGRAPHIC MONITORING

The Water Licence requires that a monitoring event of Garrow Lake Stratigraphy be conducted during the mid-winter, maximum ice thickness and at maximum ice melt during the summer. Sampling was conducted in January and in March. Garrow Lake did not clear of ice sufficiently to safely collect data during the "minimum ice conditions" during the summer. Results of the sampling indicate that the lake remains stable and metals concentrations have not changed significantly. Refer to Appendix 18 for presentation of the monitoring data.

12. WATER LICENCE EFFLUENT MONITORING

12.1. Correspondence Regarding Application of Metal Mining Effluent Regulations

12.1.1. TSS Exceedance from Final Discharge Point

Refer to Section 3 of this report.

12.1.2. Missed Sublethal Toxicity Testing Event During 2003

On March 29th 2004, Azimuth Consultants provided an explanation of the circumstances regarding missing the 2nd sublethal toxicity testing event from 2003. This was due to the unique discharge characteristics and receiving environment a Polaris which makes the MMER more difficult to interpret and apply compared to mines discharging under more normal conditions. In a letter dated April 27th from Environment Canada, accepted the explanation for the missed sampling event and no formal action by Environment Canada is forthcoming. Both of these letters are included in Appendix 19.

12.1.3. Notice to Environment Canada of Alteration of system at Final Discharge Point

A letter dated April 27th, 2004 was submitted to Environment Canada giving notice that the Final Discharge Point at Garrow Dam was altered due to the decommissioning of the dam and the removal of the effluent siphoning system. The actual location of the Final Discharge Point was not moved so it remains the same as specified in the Water Licence. This letter is included in Appendix 19.

12.1.4. 2004 EEM Field Study Program

On March 9, 2004 Azimuth Consultants on behalf of Teck Cominco submitted a draft plan for the 2004 EEM Study Design. This was done in response to a meeting held with

the Technical Advisory Committee of EC (in December 2003) to discuss planning for the 2004 summer field program. EC's response accepting the proposed study outline with some minor modifications was emailed to Teck Cominco and Azimuth on April 4, 2004. In August 2004, Azimuth mobilized to Polaris along with a support crew and other resources on August 14th. It is mid August when the ice normally clears from Garrow Bay but this does not necessarily happen every year. It was apparent that the ice in Garrow Bay was fairly solidly locked to shore so it did not appear it as going to clear. Unless the ice cleared, it was not possible to conduct the planned field program. EC was notified of this and they responded acknowledging that we had informed them and then EC followed up with another email on August 23rd with information from the Canadian Ice Service predicting that the ice would not clear. Teck Cominco had agreement from EC that we would be required to conduct a two week field program to conduct the study program and if it could not be completed within this time frame that Teck Cominco would not be obligated to make further attempts. Azimuth remained on site for the two weeks and the ice did not clear so the field program did not occur. All of this correspondence is included in Appendix 19.

12.2. SUMMARY OF EFFLUENT MONITORING AND EFFLUENT CHARACTERIZATION

12.2.1. 2003 Annual MMER Report

Under the MMER and the Water Licence, an annual report summarizing the previous years MMER sampling must be submitted. The annual MMER report is included in Appendix 20. All discharge for the year 2003 was compliant with the MMER and the Water Licence.

12.2.2. 2004 Quarterly and Annual MMER Report

Under the MMER and the Water Licence, the Garrow Lake effluent discharge at the Final Discharge Point must be monitored and reported quarterly and annually. These reports are included in Appendix 20. Appendix 19 includes a revised Annual MMER report previously submitted to Environment Canada, the NWB and INAC in September 18, 2004 that addresses a number of minor deficiencies in the original reports submitted.

With the exception of a single TSS exceedance, all effluent discharge was compliant with the MMER and the Water Licence.

13. SUMMARY OF GARROW LAKE DFO STUDY PROGRAM

Enclosed in Appendix 21 a copy of the report titled "Limnology and Ecology of Garrow Lake, Little Cornwallis Island, Nunavut – August 2003" by Azimuth Consulting Group Inc. This study was done as part of the requirements contained in the DFO Fisheries Authorization to lower Garrow Lake back to its original elevation in preparation to remove Garrow Dam. The study conducted by Azimuth examined the limnology and ecology of Garrow Lake to assess the current conditions after being utilized for tailings disposal over 20 years. It concludes that the tailings deposition has not changed the limnological conditions in the mixolimnion. The zinc concentrations in the mixolimnion are currently about 0.22 ppm due to a tailings line break in 1984/1985. No zooplankton species were captured during the 2003 survey of the lake. Invertebrates collected included Oligochaetes, nematodes and Foraminifera. Chironamid larvae were not collected from the sediment but were found in the stomachs of the fourhorn sculpin.

All 19 sculpins captured in 2003 appeared to be healthy with no external or internal tumors, scars or other abnormalities. The authors stated "Overall, it appears as if the size, distribution, growth rate and reproductive status of the sculpin community has not changed markedly since pre-mining studies" They also indicated that the sculpins did not seem to be as abundant as pre-mine studies but there is no data of catch per-unit-effort. They conclude that "Nevertheless sculpins have survived in Garrow Lake throughout the history of mining and tailings deposition to the lake, which is still designated as a tailings disposal facility."

14. STATUS OF SITE AS OF DECEMBER 31, 2004

As of September 7th, 2004 all of the work identified in the Decommissioning and Reclamation Plan (DRP) has been completed with a few minor exceptions that will be completed over the next few summer seasons. Work undertaken was in keeping with the approved DRP or in accordance with approved changes to the DRP. While the volumes of contaminated materials greatly exceeded original estimates, the project was completed on schedule. We have left a small exploration style shelters on site, along with supplies and some heavy equipment to facilitate implementing the monitoring program and to address the minor re-sloping of a few areas on site.

In Teck Cominco's opinion (that we expect to be verified through the on-going site monitoring program), the reclamation activities have accomplished the goals set out in the DRP and the site will be physically and chemically stable in the long term. While some features such as roadways are virtually impossible to reclaim in the arctic, the visual appearance of the site has been substantially restored.

APPENDIX 1

EXECUTIVE SUMMARY

OF

2004 DECOMMISSIONING AND RECLAMATION REPORT

IN INUKTITUT

APPENDIX 2

UNAUTHORIZED DISCHARGES

OR

SPILLS

August 12, 2004

Environment Canada
Nunavut Regional Office
Environmental Protection Branch
P.O. Box 1870
Iqaluit, NU
X0A 0H0

Attention: Sid Bruinsma, Enforcement / Emergencies Officer, Nunavut Northern Division

Dear Sir:

Re: <u>Polaris Mine – Garrow Lake Final Discharge Point Exceedance of TSS Sample Under Schedule 4 of the MMER</u>

In accordance with section 24 (2) of the Metal Mining Effluent Regulations ("MMER"), please be advised that on August 9, 2004 we received laboratory results indicating that a single weekly effluent sample taken July 7th, 2004 from the final discharge point of Garrow Lake (a single grab sample) had a Total Suspended Solids (TSS) level of 117 mg/L which exceeded the TSS limits in Schedule 4 of the MMER (limit of 30 mg/L for a single grab sample). Concurrently on July 7th we also took our monthly acute lethality samples. The results were compliant with the MMER and showed no acute toxicity to either the Rainbow Trout or the Daphnia magna (i.e. LC50s in both cases were > 100% effluent). I have attached copies of both of these laboratory results. The date on the laboratory record for the metals analysis states that the sample was taken on July 6th but this is incorrect. The metals samples were originally scheduled to be taken on the 6th and the bottles were labeled as such by our consultant but fog delayed the plane that ships the samples to the laboratory so the sample was actually taken on the 7th at the same time as the acute lethality samples (and the dates on the bottles and associated chain of custody papers were not updated).

The July 7th sample was taken during the first week of effluent discharge from Garrow Lake. The TSS level was the result of Garrow Lake being ice covered which blocks the creek inlet (Garrow Creek) until the ice melted sufficiently to uncork the lake, and then the flows increase to a peak very quickly causing turbidity in the creek channel. The peak flows last a day or two and then the flows gradually subside with the TSS levels decreasing concurrently. As stated previously, the turbidity is not from tailings being mobilized as evidenced by the metals concentrations in the July 7th sample being in compliance (i.e. Zn concentrations were 0.198 mg/L). The TSS levels in the subsequent weekly water sample (July 13th) was in compliance (TSS was 5.7 mg/L) and metals concentrations continued to be in compliance (Zn was 0.106 mg/L). I have also attached the final results for the July 20th weekly water samples (TSS was <3.0 mg/L and the Zn was 0.0435 mg/L). The July 27th weekly water sample interim laboratory results report TSS at 3.7 mg/L and the Zn results are not available yet. Samples for the acute lethality tests were also taken on July 27th and compliant results were again achieved with the LC50 being >100 for both

the Rainbow Trout and the Daphnia magna (attached). I will forward the final July 27th laboratory results once they are received.

If you have any other questions in the interim, please contact me at (250) 427-8405 or by email at bruce.donald@teckcominco.com

Yours truly,

Bruce Donald

Attachments: July 7th Monthly Water Sample Results
July 7th Acute Lethality Sample Results
July 13th Weekly Water Sample Results
July 20th Weekly Water Sample Results
July 27th Acute Lethality Sample Results

Cc: Walter Kuit (Teck Cominco)
Bob Hutchinson (Teck Cominco)
Patrick Allard (Azimuth Consulting)
Phyllis Beaulieu (Nunavut Water Board)

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date: August 9, 2004

ALS File No. U5572

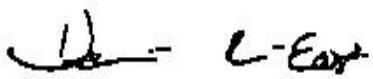
Report On: Polaris Water Analysis

Report To: **Azimuth Consulting Group Inc.**
218 - 2902 West Broadway
Vancouver, BC
V6K 2G8

Attention: **Mr. Randy Baker**

Received: July 12, 2004

ALS ENVIRONMENTAL
per:



Heather A. Ross-Easton, B.Sc. - Project Chemist
Andre Langlais, M.Sc. - Project Chemist

File No. U5572

RESULTS OF ANALYSIS - Water

Sample ID			G Creek	Dup	F Blank	T Blank
Sample Date			04-07-06	04-07-06	04-07-06	04-07-06
Sample Time			11:00	11:00	11:00	11:00
ALS ID			*1*	*2*	*3*	*4*
Physical Tests						
Hardness	CaCO3		1400	1400	<0.54	<0.54
pH			8.05	8.06	-	-
Salinity	o/oo		7.0	6.9	-	-
Total Suspended Solids			117	120	-	-
Dissolved Anions						
Alkalinity-Total		CaCO3	138	132	-	-
Nutrients						
Ammonia Nitrogen		N	0.071	0.069	-	-
Nitrate Nitrogen		N	0.277	0.284	-	-
Cyanides						
Total Cyanide	CN		<0.0050	<0.0050	-	-
Total Metals						
Aluminum	T-Al		0.34	0.26	<0.10	<0.10
Arsenic	T-As		<0.0010	<0.0010	<0.0010	<0.0010
Cadmium	T-Cd		0.000588	0.000582	<0.000020	<0.000020
Calcium	T-Ca		140	139	<0.050	<0.050
Copper	T-Cu		0.00265	0.00252	0.00012	0.00012
Iron	T-Fe		0.487	0.441	<0.010	<0.010
Lead	T-Pb		0.00269	0.00240	0.00017	0.00021
Magnesium	T-Mg		256	256	<0.10	<0.10
Mercury	T-Hg		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	T-Mo		<0.0050	<0.0050	<0.0050	<0.0050
Nickel	T-Ni		0.00442	0.00438	<0.00050	<0.00050
Zinc	T-Zn		0.198	0.196	0.0012	<0.0010
Radiological Parameters						
Radium-226 [1,2]			0.0200	0.0200	<0.0050	0.0060

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
[1]Results are expressed as Becquerels per litre (Bq/L). This analysis is
[2]subcontracted to SRC from Saskatoon.

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Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Alkalinity in Water by Titration

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

Recommended Holding Time:
Sample: 14 days
Reference: APHA

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For more detail see ALS Environmental "Collection & Sampling Guide"

Ammonia in Water by Selective Ion Electrode

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

Recommended Holding Time:
Sample: 28 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:
Sample: 28 days (bromide, chloride, fluoride, sulphate)
Sample: 2 days (nitrate, nitrite)
Reference: APHA and EPA
For more detail see ALS Environmental "Collection & Sampling Guide"

Cyanide Species in Water

This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide and weak acid dissociable (WAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method. Cyanate is determined by the cyanate hydrolysis method using an ammonia selective electrode. Thiocyanate is determined by the ferric nitrate colourimetric method.

Recommended Holding Time:
Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures

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may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis of the seawater is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Trace Metals in Seawater by SPR-IDA Chelation

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS) and/or routine atomic absorption spectrophotometry techniques (EPA 7000 series).

Recommended Holding Time:

Sample/Extract:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

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Appendix 1 - METHODOLOGY - Continued

Mercury in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

Sample:	28 days
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

Sample:	28 days
Reference:	EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

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EVS environment consultants

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Fax: 604-662-8548
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FAX TRANSMITTAL SHEET

TO:	Cheryl Mackintosh	**DATE:**	July 16, 2004
	Azimuth Consulting Group	**PROJECT No.:**	09-0302-54
	218 – 2902 West Broadway	**W.O. No.:**	0400304,307
	Vancouver, BC	**FAX No.:**	604-739-9070
	V6K 2G8	**TEL No.:**	604-730-1220
SENT BY:	Robert Harrison	**# PAGES (incl. cover):**	One (1)

This message is intended only for the use of the individual or entity to which it is addressed and may contain information that is privileged confidential and exempt from disclosure under applicable law. If you have received this communication in error please notify us by telephone (collect) and return the original transmission to us by mail without making a copy. Thank you.

Re: Interim data for the 96-h rainbow trout and 48-h *Daphnia magna* LC50 toxicity tests performed on the sample identified as G-Creek acute 070704 (collected July 7, 2004).

Sample ID	Sample Collection Date	**LC50 (95% Confidence Limits) [%vol/vol]**	
		96-h Rainbow Trout	**48-h *Daphnia magna***
G-Creek acute 070704	July 7, 2004 (2200h)	> 100	> 100

Please note that these are draft results and are subject to a QA/QC review. A complete report will follow by mail. Should you have any questions, please contact Edmund Canaria, Manager of Laboratory Services, or myself at 604-986-4331.

Thank you,

Robert Harrison, B.Sc. Hons.
Assistant Bioassay Test Supervisor – Fish Team
rharrison@evsenvironment.com

REH

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date: August 9, 2004

ALS File No. U5829

Report On: Polaris Water Analysis

Report To: **Azimuth Consulting Group Inc.**
218 - 2902 West Broadway
Vancouver, BC
V6K 2G8

Attention: **Mr. Randy Baker**

Received: July 16, 2004

ALS ENVIRONMENTAL
per:

Heather A. Ross-Easton, B.Sc. - Project Chemist
Andre Langlais, M.Sc. - Project Chemist

REMARKS

The detection limits for some of the metals have been increased for the sample "G Creek" due to sample matrix interferences.

A Campbell Brothers Limited Company

File No. U5829

RESULTS OF ANALYSIS - Water

Sample ID		G Creek
Sample Date		04-07-13
ALS ID		*1*
Physical Tests		
pH		7.90
Salinity	o/oo	4.5
Total Suspended Solids		5.7
Cyanides		
Total Cyanide	CN	<0.0050
Total Metals		
Aluminum	T-Al	<0.40
Arsenic	T-As	<0.0020
Cadmium	T-Cd	0.000332
Copper	T-Cu	0.000703
Iron	T-Fe	0.019
Lead	T-Pb	0.000318
Molybdenum	T-Mo	<0.0050
Nickel	T-Ni	0.00204
Zinc	T-Zn	0.106
Radiological Parameters		
Radium-226 [1,2]		0.0070

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
[1]Result is expressed as Becquerels per litre (Bq/L). This analysis is
[2]subcontracted to SRC, Saskatoon.

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Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Cyanide Species in Water

This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide and weak acid dissociable (WAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method. Cyanate is determined by the cyanate hydrolysis method using an ammonia selective electrode. Thiocyanate is determined by the ferric nitrate colourimetric method.

Recommended Holding Time:

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Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Metals in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis of the seawater is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Trace Metals in Seawater by SPR-IDA Chelation

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS) and/or routine atomic absorption spectrophotometry techniques (EPA 7000 series).

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Appendix 1 - METHODOLOGY - Continued

Recommended Holding Time:

Sample/Extract:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

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End of Report

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CHEMICAL ANALYSIS REPORT

Date: August 11, 2004

ALS File No. U6161

Report On: Polaris Water Analysis

Report To: **Azimuth Consulting Group Inc.**
218 - 2902 West Broadway
Vancouver, BC
V6K 2G8

Attention: **Mr. Randy Baker**

Received: July 24, 2004

ALS ENVIRONMENTAL
per:

Andre Langlais, M.Sc. - Project Chemist
Heather A. Ross-Easton, B.Sc. - Project Chemist

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

File No. U6161

RESULTS OF ANALYSIS - Water

Sample ID		G-Creek_ Gen_ 072004	Tracer Dye	Injectn. Dye	G-Creek_ Rhod_ 072004
Sample Date		04-07-20	04-07-20	04-07-20	04-07-20
ALS ID		*1*	*2*	*3*	*4*
Physical Tests					
pH		7.86	-	-	-
Salinity	o/oo	3.3	-	-	-
Total Suspended Solids		<3.0	-	-	-
Cyanides					
Total Cyanide	CN	<0.0050	-	-	-
Total Metals					
Aluminum	T-Al	<0.20	-	-	-
Arsenic	T-As	<0.0020	-	-	-
Cadmium	T-Cd	0.000109	-	-	-
Copper	T-Cu	0.000427	-	-	-
Iron	T-Fe	<0.010	-	-	-
Lead	T-Pb	0.000837	-	-	-
Molybdenum	T-Mo	<0.0050	-	-	-
Nickel	T-Ni	0.000876	-	-	-
Zinc	T-Zn	0.0435	-	-	-
Miscellaneous					
Rhodamine		-	see below[1]	76900	0.0380
Radiological Parameters					
Radium-226[2,3]		<0.0050	-	-	-

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
[1]This sample was used to prepare calibration standards
[2]Result is expressed as Becquerels per litre (Bq/L). This analysis is
[3]subcontracted to SRC, Saskatoon.

File No. U6161

Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Cyanide Species in Water

This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide and weak acid dissociable (WAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method. Cyanate is determined by the cyanate hydrolysis method using an ammonia selective electrode. Thiocyanate is determined by the ferric nitrate colourimetric method.

Recommended Holding Time:

Appendix 1 - METHODOLOGY - Continued

Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Metals in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis of the seawater is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Trace Metals in Seawater by SPR-IDA Chelation

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS) and/or routine atomic absorption spectrophotometry techniques (EPA 7000 series).

Appendix 1 - METHODOLOGY - Continued

Recommended Holding Time:
Sample/Extract: 6 months
Reference: Puget
For more detail see ALS Environmental "Collection & Sampling Guide"

Rhodamine WT in Water

This analysis is carried out using a Waters Model 470 Scanning Fluorescence Detector. Prior to analysis, samples are warmed to room temperature and then an aliquot of the sample is filtered through a 0.45 um cellulose acetate filter to remove some of the potential interferences. After filtration, a portion of the sample, typically 500 uL, is injected into the fluorescence detector. An excitation wavelength of 556 nm is used and fluorescence is measured at an emission wavelength of 580 nm.

Please note the following: This method is non-selective and subject to many interferences. Typical interferences may include; pH, salinity, temperature, suspended matter, photochemical degradation of Rhodamine WT, and some types of algae pigments. Detection for this analysis is not chromatographic; therefore, anything present in the sample that fluoresces at the same wavelength as Rhodamine WT will be detected and reported as Rhodamine WT. Results reported using this method should be considered semi-quantitative in nature.

Recommended Holding Time:
Sample: None Available
Reference: None Available
For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

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End of Report

EVS environment consultants

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FAX TRANSMITTAL SHEET

TO:	Cheryl Mackintosh	**DATE:**	August 9, 2004
	Azimuth Consulting Group	**PROJECT No.:**	09-0302-54
	218 – 2902 West Broadway	**W.O. No.:**	0400342,348
	Vancouver, BC	**FAX No.:**	604-739-9070
	V6K 2G8	**TEL No.:**	604-730-1220
SENT BY:	Rachel DeWynter	**# PAGES (incl. cover):**	One (1)

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Re: Interim data for the 96-h rainbow trout and 48-h *Daphnia magna* LC50 toxicity tests performed on the sample identified as G-Creek acute 270704 (collected July 27, 2004).

Sample ID	Sample Collection Date	LC50 (95% Confidence Limits) [%vol/vol]	
		96-h Rainbow Trout	48-h *Daphnia magna*
G-Creek acute 270704	July 27, 2004 (09:30h)	> 100	> 100

Please note that these are draft results and are subject to a QA/QC review. A complete report will follow by mail. Should you have any questions, please contact Edmund Canaria or myself at 604-986-4331.

Thank you,

Jennifer Young, B.Sc.
Bioassay Test Supervisor – Cladoceran Team
jyoung@evsenvironment.com

RSD

Environment Canada | Environnement Canada

Environment Canada
Environmental Protection Branch
Prairie and Northern Region
Northern Division
P.O. Box 1870 Iqaluit, Nunavut
X0A 0H0

PROTECTED
WITHOUT PREJUDICE

11 January 2005

Occurrence Files: 4408-2004-09-13-001
4408-2004-12-01-001

Mr. David Thompson
Deputy Chairman and CEO
Teck Cominco Metals Ltd.
Suite 600 – 200 Burrard Street
Vancouver, British Columbia
V6C 3L9

and

Mr. Bruce Donald
Manager of Operations
Teck Cominco Metals Ltd.
Polaris Mine Operation
Polaris, Little Cornwallis Island, Nunavut
X0A 0Y0

Dear Sirs;

FISHERIES ACT - Metal Mining Effluent Regulations (MMER)

I wish to acknowledge your letter of 12 August 2004 advising Environment Canada of the details surrounding the exceedance of the MMER Total Suspend Solid limits at the Polaris Mine site on July 07th 2004. I also acknowledge you timely submission of the 3rd quarter MMER report dated 17 November 2004 as required by the regulations.

Upon review of the above mentioned supporting documentation supplied by your company no further action will be pursued of this alleged violation. For more information or to comment, on the alleged facts, contained in this letter, please contact the undersigned. Your comments will be considered and, where appropriate, a response

/1

Canada

provided. Any comments you make, as well as Environment Canada's response, will be retained and filed with this letter in Environment Canada's records.

Respectfully,

Sidney F. Bruinsma
Enforcement / Emergencies Officer, Nunavut
Northern Division, Environmental Protection Branch
ENVIRONMENT CANADA
Box 1870, Iqaluit, Nunavut X0A 0H0
Ph. 867-975-4644
Fax 867-975-4645
sid.bruinsma@ec.gc.ca

cc: Craig Broome
Head of Enforcement, Northern Division
Environmental Protection Branch
Prairie and Northern Region
Yellowknife, NWT

FILE NOTE

Bruce Donald,
Reclamation Manager
Environment and Corporate Affairs
Teck Cominco Limited

Date: **June 23, 2004**

Subject: **Polaris Mine - Discovery of Liquid Petroleum Hydrocarbons During Remediation of Maintenance Facilities**

The following is a summary of information related to the discovery of liquid petroleum hydrocarbon within an area of known soil hydrocarbon contamination during the demolition and reclamation program at the Polaris Mine site at the Polaris Mine on Little Cornwallis Island, Nunavut.

Background:

The Polaris Mine has been in operation since 1982. The mine has three metal Foldaway buildings located immediately adjacent to each other where mobile equipment has been stored and maintained over the years when the mine was in operation. The mine is now closed and environmental assessments conducted as part of closure planning identified hydrocarbon contamination of the soils in the area surrounding these three buildings. The buildings are currently being demolished and 2 of the 3 buildings have been removed. Remediation of hydrocarbon contaminated soils by excavation has been completed at the first of the buildings being demolished. Remediation of the contaminated soils at the second building was approximately 20% complete when water with liquid petroleum hydrocarbons were discovered under the foot print of the building. This discovery was made on June 19, 2004.

Source of Hydrocarbons:

A specific time and source of the hydrocarbon leaks and/or spills can not be identified due to the long term use of this area. There are no apparent current or on-going sources of leaks in the area.

Volume Estimation:

The area of contaminated soils in total in the area of the three buildings is approximately 3,000 square metres. Drilling of the area indicated that the contaminated soils extend approximately 3 metres deep. The liquid hydrocarbon products were floating on water in a puddle in the excavation under Foldaway #1. The area of ponding was approximately 9 square metres. The water/oil mixture was recovered by pumping it into barrels and a larger tank. As the water was pumped, additional volumes seeped from surrounding soils. All of the water and free product have now been recovered. Approximately 2,100 liters of water and 400 liters of hydrocarbons were recovered from this area. Observations indicated that heat from the buildings depressed the active layer in this area creating a basin that contained the hydrocarbon limiting both the vertical and horizontal extent of contamination.

Remedial Action:

The contaminated soils in the area were being actively being remediated when the liquid petroleum products were discovered. Upon completion of recovery of the hydrocarbon/water mixture, the surrounding contaminated soils are being excavated. Excavation of the contaminated soils surrounding this building has continued on a continuous (24 hours per day) basis and is nearing completion. No further liquid petroleum products have been in evidence since. Excavation of contaminated soils related to this building is estimated to be 75% complete at this time. The last remaining Foldaway building will be demolished during the next two to three weeks and reclamation of this area will be complete within a maximum of three weeks. Recovery of the hydrocarbon contaminated soils are being conducted under the guidance of a team of independent environmental consultants who are located on-site. Upon completion of remediation of this area, confirmatory sampling will be undertaken to verify remedial efforts meet the remedial targets at the site as approved in the mine's Decommissioning and Reclamation Plan. A formal report presenting the confirmatory sampling data will be prepared and presented as part of the regular project reporting.

Gartner Lee Limited

memorandum

to: Bruce Donald, P.Eng, Reclamation Manager, Teck Cominco Limited
from: Brenda Bolton
date: March 2, 2005
ref: 40-137
re: **2004 Concentrate Shed Sampling Results**

The former concentrate storage shed area was located south of the process barge and shiploading dock. The metal-clad, steel frame shed was used to store lead and zinc concentrates produced in the mill through the winter for shipment to market in the short summer shipping season. The concentrate storage shed was subdivided to provide storage capacity for 40,000 tonnes lead concentrate at the north end and 175,000 tonnes zinc concentrate at the south end. The concentrate load-out conveyors were located along the west wall of the concentrate storage shed and fed the shiploader at the loading dock. The building was demolished in August 2003.

Removal of small quantities of residual soil impacted with lead and zinc concentrate from within the fractured limestone bedrock by the remedial methods originally proposed proved impractical. Therefore, GLL investigated alternative methods to limit the contact of this material to human or ecological receptors and found that the best alternative was to isolate the residual concentrate dust under a durable cover of sand and gravel, a soil cover. The placement of the soil cover meets the principal objective of the original remediation plan, which is to eliminate the exposure pathways of the lead and zinc concentrate to human and ecological receptors at the Polaris Mine site.

Following the demolition and attempted remediation of the Concentrate Shed footprint, the area was used for storage of machinery and pallets of assorted fluids. On June 10, 2004 at 3:15 pm, an employee of Teck Cominco noted that an area surrounding a pallet of oil was saturated. An approximate volume of twenty two cubic meters was removed the same day by 9:00 pm. The dimensions of the excavation were approximately 6 meters by 4 meters, and 0.5 meters deep.

A representative of Gartner Lee Ltd. examined the excavated area on June 11, 2004. There was no sheen observed on a puddle located in the excavated depression, nor was there any detectable odour. Two samples were collected in accordance with standard GLL and TCL sampling procedures and protocols – one composite from the wall of the excavation, and one composite sample from the floor of the excavation. Both samples were sent to Analytical Laboratory Services (ALS) of Vancouver BC, in clean Teflon lined jars to confirm the presence and nature of hydrocarbon compounds.

Analytical laboratory confirmatory results for hydrocarbons are summarized in Table 1, along with the approved Polaris Mine SQROs for hydrocarbons. All samples sent to the analytical laboratory confirmed Extrable Petroleum Hydrocarbons (EPH) below the soil quality remediation objective (SQRO) of 1,000 mg/kg. Based on the laboratory results, no further remedial excavation was required.

Yours very truly,
GARTNER LEE LIMITED

Brenda Bolton
Environmental Geologist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

Rob Dickin.
Principal

Table 1. Utilidor Hydrocarbon Sample Results

Gartner Lee	FEDERAL CCME GUIDELINES[a]		Polaris Mine Soil Quality Remediation Objective	Location	Concentrate Shed	
	Residential / Parkland Land Use Guideline			Sample ID	04-369-11362-W-C	04-369-11363-F-C
				Date Sampled	11/06/2004	12/06/2004
				ALS File No.	U4483	U4483
				Field Screen (ppm)[b]	-	-
Parameter	**CEQG**	**PHC CWS[b,c,d]**	**Site-Specific**	**Units**	**Analytical Results**	
Non-Halogenated Volatiles						
Benzene	*0.5*	-	-	mg/kg	<0.040	<0.040
Ethylbenzene	*1.2*	-	-	mg/kg	<0.050	<0.050
Styrene	-	-	-	mg/kg	<0.050	<0.050
Toluene	*0.8*	-	-	mg/kg	<0.050	<0.050
meta- & para-Xylene	-	-	-	mg/kg	<0.050	<0.050
ortho-Xylene	-	-	-	mg/kg	<0.050	<0.050
Total Xylenes	*1.0*	-	-	mg/kg	<0.10	<0.10
Extractable Hydrocarbons						
F1 (C6-C10)	-	-	-	mg/kg	<10	<10
F1-BTEX	-	*130* (coarse)	-	mg/kg	<10	<10
F2 (C10-C16)	-	*450* (coarse)[f]	-	mg/kg	51	35
F3 (C16-C34)	-	*400* (coarse)[f]	-	mg/kg	261	277
F4 (C34-C50)	-	*2800* (coarse)	-	mg/kg	124	72
F4G-sg[d]	-	-	-	mg/kg	690	<500
F4G-SG Required (yes/no)	-	-	-	mg/kg	yes	yes
Extractable Hydrocarbons						
EPH10-19	-	-	1000	mg/kg	<200	<200
EPH19-32	-	-	1000	mg/kg	290	<200

Bold Concentration greater than or equal to CCME RL Guideline for soil and/or the site-specific SQRO.

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

[a] Canadian Environmental Quality Guidelines (CEQG) and Petroleum Hydrocarbon Canada-Wide Standards (PHC CWS) presented apply to soil.

[b] Guideline is dependant upon depth of sample (surface, subsoil >1.5 m depth). Surface soil analyzed.

[c] Guideline is dependent on median grain size of soil analyzed (Fine≤75 µm, Coarse >75 µm). Median grain size of soil analyzed is >75 µm.

[d] Guideline is based on the site-specific exposure pathway of Ecological Soil Contact

[e] Total Xylene calculated as the sum of meta, para and ortho Xylenes

[f] Use of the guideline requires that PAHs be subtracted from the fraction. Based on the results for soil sample A1 it is assumed that PAHs form a small percentage of the fractions 2 and 3 for the samples not analyzed for PAHs.

d) Fraction 4G measures carbon chain length in excess of C16.

Gartner Lee Limited

memorandum

to: Bruce Donald, P.Eng, Reclamation Manager, Teck Cominco Limited
from: Dennis Lu
date: April 14, 2005
ref: 40-137
re: **2004 Utilidor Sampling Results**

This memo is in response to the fuel leak on March 20, 2003 at the Utilidor. It addresses the nature of the spill, investigation and results of the sampling events.

The Utilidor is a utility corridor that runs from the accommodations complex to the barge. It houses various utilities including sewage, electrical and fuel. On March 20, 2003, a small fuel leak was discovered along the Utilidor near the junction of the haul road above the barge and the road leading to the accommodations. Upon identification of the leak, the fuel was shut off and the leak was patched immediately. There was no documentation of the amount of fuel spilled during this leak. The leak occurred on the east side of the road and followed the Utilidor path beneath the road and ponded in the barge area. The barge area was an area targeted for hydrocarbon remediation and the fuel that leaked from the Utilidor would be handled accordingly during the area remediation.

Inspection of the site occurred after snowmelt by GLL in July 2004. Upon inspection of the site, no visible staining was apparent. Screening samples were collected to identify the surface and sub-surface quality of the soil and any potential hydrocarbon contamination in the soil.

Delineation of the potentially hydrocarbon impacted area was accomplished through screening level sampling of the surface and subsurface material in the targeted area for remediation. Two boreholes were advanced in the area immediately below the fuel spill to confirm the spill had traveled along the Utilidor and not through the roadbed. The subsurface samples were collected using a drill-mounted excavator to allow for observations at depth.

Samples from the boreholes were collected over a 0.75 m interval to bedrock at a depth of 2.25 m. The samples were field screened with a Photo-ionization detector (PID). A subset of the on site field screening samples were sent to Analytical Laboratory Services (ALS) of Vancouver BC, in clean Teflon lined jars to confirm the presence and nature of hydrocarbon compounds.

The olfactory condition and field screening measurements of the concentrations of organic vapours in the soil samples from the southern borehole indicated possible subsurface hydrocarbon contamination. To confirm a clean vertical profile, the sample with the highest organic reading (Barge-10614-BH-C), and the sample below (Barge-10615-BH-C) were submitted to the lab for analysis. The borehole north of the Utilidor did not show signs of potential contamination; the sample with the highest organic reading from the borehole (Barge-10610-BH-C) was submitted for laboratory analysis to determine horizontal extent.

The Utilidor, and soils directly surrounding it were excavated and disposed. Upon removal of the Utilidor, two surface soil samples were collected from the footprint and surrounding area. The two composite samples were collected in accordance with standard GLL and TCL sampling procedures and protocols.

Analytical laboratory confirmatory results for hydrocarbons are summarized in Table 1, along with the approved Polaris Mine SQROs for hydrocarbons. The soil quality results and the lateral limits of samples are shown in the Barge area close out report Figure Barge-01-2. A total of 5 screening samples were submitted for petroleum hydrocarbons (3 borehole samples and 2 composite area samples). All samples sent to the analytical laboratory confirmed Extractable Petroleum Hydrocarbons (EPH) below the soil quality remediation objective (SQRO) of 1,000 mg/kg. Samples collected from the footprint of the Utilidor were also analysed to Canada Wide Standards (CWS) for Petroleum Hydrocarbons (PHC). All samples submitted returned results below the PHC CWS for Parkland Land Use.

Table 1. Utilidor Hydrocarbon Sample Results

Gartner Lee	FEDERAL CCME GUIDELINES[a]		Polaris Mine Soil Quality Remediation Objective	Location	Utilidor				
				Sample ID	Barge-10610-BH-C	Barge-10614-BH-C	Barge-10615-BH-C	Barge-12179-F-C	Barge-12180-F-C
				Date Sampled	13/05/2004	13/05/2004	13/05/2004	27/08/2004	27/08/2004
	Residential / Parkland Land Use Guideline			ALS File No.	U3564rr	U3564rr	U3564rr	U7584	U7584
				Field Screen (ppm)[b]	75	225	85	10	10
Parameter	**CEQG**	**PHC CWS[b,c,d]**	**Site-Specific**	**Units**	**Analytical Results**				
Non-Halogenated Volatiles									
Benzene	*0.5*			mg/kg	-	-	-	<0.040	<0.040
F1 (C6-C10)				mg/kg	-	-	-	<10	<10
F1-BTEX		*130* (coarse)		mg/kg	-	-	-	<10	<10
Ethylbenzene	*1.2*			mg/kg	-	-	-	<0.050	<0.050
Styrene				mg/kg	-	-	-	<0.050	<0.050
Toluene	*0.8*			mg/kg	-	-	-	<0.050	<0.050
meta- & para-Xylene				mg/kg	-	-	-	<0.050	<0.050
ortho-Xylene				mg/kg	-	-	-	<0.050	<0.050
Total Xylenes	*1.0*			mg/kg	-	-	-	<0.10	<0.10
Extractable Hydrocarbons									
F2 (C10-C16)		*450* (coarse)[f]		mg/kg	-	-	-	41	43
F3 (C16-C34)		*400* (coarse)[f]		mg/kg	-	-	-	253	271
F4 (C34-C50)		*2800* (coarse)		mg/kg	-	-	-	176	188
F4G-sg[d]				mg/kg	-	-	-	820	930
F4G-SG Required (yes/no)				mg/kg	-	-	-	YES	YES
Extractable Hydrocabrons									
EPH10-19			1000	mg/kg	<200	<200	<200	<200	<200
EPH19-32			1000	mg/kg	230	330	250	230	220

Bold Concentration greater than or equal to CCME RL Guideline for soil and/or the site-specific SQRO.

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

[a] Canadian Environmental Quality Guidelines (CEQG) and Petroleum Hydrocarbon Canada-Wide Standards (PHC CWS) presented apply to soil.

[b] Guideline is dependant upon depth of sample (surface, subsoil >1.5 m depth). Surface soil analyzed.

[c] Guideline is dependent on median grain size of soil analyzed (Fine≤75 µm, Coarse >75 µm). Median grain size of soil analyzed is >75 µm.

[d] Guideline is based on the site-specific exposure pathway of Ecological Soil Contact

[e] Total Xylene calculated as the sum of meta, para and ortho Xylenes

[f] Use of the guideline requires that PAHs be subtracted from the fraction. Based on the results for soil sample A1 it is assumed that PAHs form a small percentage of the fractions 2 and 3 for the samples not analyzed for PAHs.

d) Fraction 4G measures carbon chain length in excess of C16.

APPENDIX 3

DECOMMISSIONING AND RECLAMATION

PROGRESS PHOTOGRAPHS

BARGE AREA
(Former Mill / Warehouse / Shop / Administration Facilities)

June 2004 - Since the beginning of 2004 only the loading ramp remains to be removed

June 2004 – Final Grading of Area in Progress

August 2004 – Loading Bridge Gone

CAT GENERATOR BUILDING

May 8, 2004 – Cat Generator Building – Contaminated Soil Excavation Proceeding Around The Building as Site Power is Still Required

June 6, 2004 – Contaminated Soil Excavation Around Cat Generator Building Mostly Competed. Building is Being Stripped for Demolition

August 26, 2004 – Cat Generator Building (and Barge) Area After Demolition and Recontouring

CONCENTRATE STORAGE BUILDING

June 2004 – Demolition essentially completed in 2003 but some footings remain

June 2004 – Conveyor Tube Between Mill and Storage Shed Remains to be removed

August 2004 – Recontouring of Concentrate Storage Building Complete

ACCOMMODATIONS COMPLEX

May 2004 – Still In Use

August 2004 – Demolition in Progress

August 2004 – Demolition In Progress

ACCOMODATION COMPLEX - Continued

August 2004 – Accommodation Building Demolished, Contaminated Soils Removed and Final Grading Completed

August 2004 – Temporary Camp

FUEL TANK FARM

May 2004 – Tank Farm Still in Use

June 2004 – Clean Tank Prior to Demolition

August 2004 – Tank Farm Removed on Temporary Fuel Bladder Remains

FUEL TANK FARM - Continued

September 6, 2004 – Tank Farm Demolished and Area Graded

INCINERATOR BUILDING

Incinerator Custom Built for Project – Stored on Site Prior to Use

May 2004 – Incinerator Building Constructed out of Sea Shipping Containers (still in use)

FOLDAWAY BUILDING DEMOLITION

May 10, 2004 – 3 Foldaway Buildings Still In Use

June 8, 2004 – Oil Contaminated Soils Excavated to South of Foldaways

June 11, 2004 – Oil Contaminated Soils Excavated to North of Foldaways

FOLDAWAY BUILIDING DEMOLITION - Continued

June 13, 2004 – First Foldaway Being Demolished

August 26, 2004 – Foldaway Area Demolition & Recontouring Complete

FIREHALL AREA

May 15, 2004 – Firehall Emptied in Preparation for Demolition

May 15, 2004 – Firehall Empty in Preparation for Demolition

August 26, 2004 – Barge and Fire Hall Areas After Completion

FRESHWATER SYSTEM

June 11, 2004 – Freshwater Tank, Pipeline and Pumphouse Still In Operation

July 2002 – Pump House and Jetty into Frustration Lake

August 2004 – Pump House Removed and Jetty Recontoured

FRESH WATER SYSTEM - Continued

Late August, 2004 – Fresh Water Tank Being Demolished

MAIN PORTAL

May 17, 2004 – Main Portal Entrance and Cooling Equipment

August 6, 2004 – Filling of Main Portal in Progress

CONVEYOR PORTAL (CV03)

June 10, 2004 – Conveyor Removed

August 2004 – Blasting Down Thin Cover Over Portal After Plug Installed

August 2004 – Re-sloped Hill Over Portal

EXPLORATION PORTAL

June 2004 – Exploration Portal (note Vent Pipe)

June 11, 2004 – Concrete Plug Inside Portal

EXPLORATION PORTAL - Continued

June 29, 2004 – Placing Fill into Portal

August 27, 2004 – Area of former Exploration Portal

NORTH PORTAL

June 2004 - North Portal Before Sealing

NORTH PORTAL - Continued

August 9, 2004 – Removed Top Cover at Collar of Portal

August 16, 2004 – Demolishing Concrete Wings at Portal Entrance

August 16, 2004 – Recontouring over Plugged Portal

DOCK DECOMMISSIONING

February 2, 2004 – Dock Before Work Starts for the Season

February 2004 – Drilling for Ice Thickness Prior to Starting Work

April 8, 2004 – Divers Cutting Sheet Piles

DOCK DECOMMISSIONING – Continued

May 11, 2004 – Digging Fill From Inside Dock Sheet Piles

May 26, 2004 Loading Sheet Piles to be Hauled to LRD Quarry landfill

May 31, 2004 – Diver Entering Water to Cut Sheet Piles

DOCK DECOMMISSIONING – Continued

June 2, 2004 – Excavation of Dock Continuing

June 18, 2004 - Decommissioning of Dock

June 26, 2004 – Decommissioning of Dock Nearing Completion

DECOMMISSIONING OF DOCK -Continued

July 15, 2004 – Decommissioning of Dock Completed

RECONTOURING MARINE FORESHORE – North of Dock

April 11, 2005 – Excavating Contaminated Soils North of Dock Area

Apr 11, 2005 – Excavated Shoreline North of Previous Picture

April 27, 2004 – Re-grading Area Shown Previously

RECONTOURING MARINE FORESHORE – North of Dock Continued

May 9, 2004 – Recontouring Further North of Dock

June 9, 2004 – Continuing Recontouring

June 9, 2004 – Final Re-grading of Area Shown in Previous Photograph

RECONTOURING MARINE FORESHORE – North of Dock Continued

June 10, June – Previous Area Almost Complete

August 26, 2004 – Area Completed. Photograph is Showing Only the North End of the Re-contoured area.

RECONTOURING MARINE FORESHORE – South of Dock

April 27, 2004 – Excavator Ripping Frozen Ground South of Dock

June 5, 2004 – Snow Pushed Back to Expose Shoreline

June 16, 2004 – Further South Along Shoreline, Berm Being Removed

RECONTOURING MARINE FORESHORE – South of Dock

June 16, 2004 – Excavating Shoreline South Towards Foldaway Buildings

July 4, 2004 – Excavator Doing Final Trimming Above Beach Area Just South of Dock

July 11, 2004 – Work Continuing on Contouring Area Above Beach

RECONTOURING MARINE FORESHORE – South of Dock

August 26, 2004 – Contouring of Foreshore Completed

March 19, 2004 – Excavating Dam

March 19, 2004 Excavating Dam

March 22, 2004 – Excavation Continues

April 13, 2005 – Dam Core Removed, Excavator Working on Centre Channel

April 16, 2004 – Installing Geotextile In Channel

April ? – Placing Rip-Rap Onto Geotextile

April 20, 2004 – Nearing Completion Placing Rip-Rap in Channel Bottom

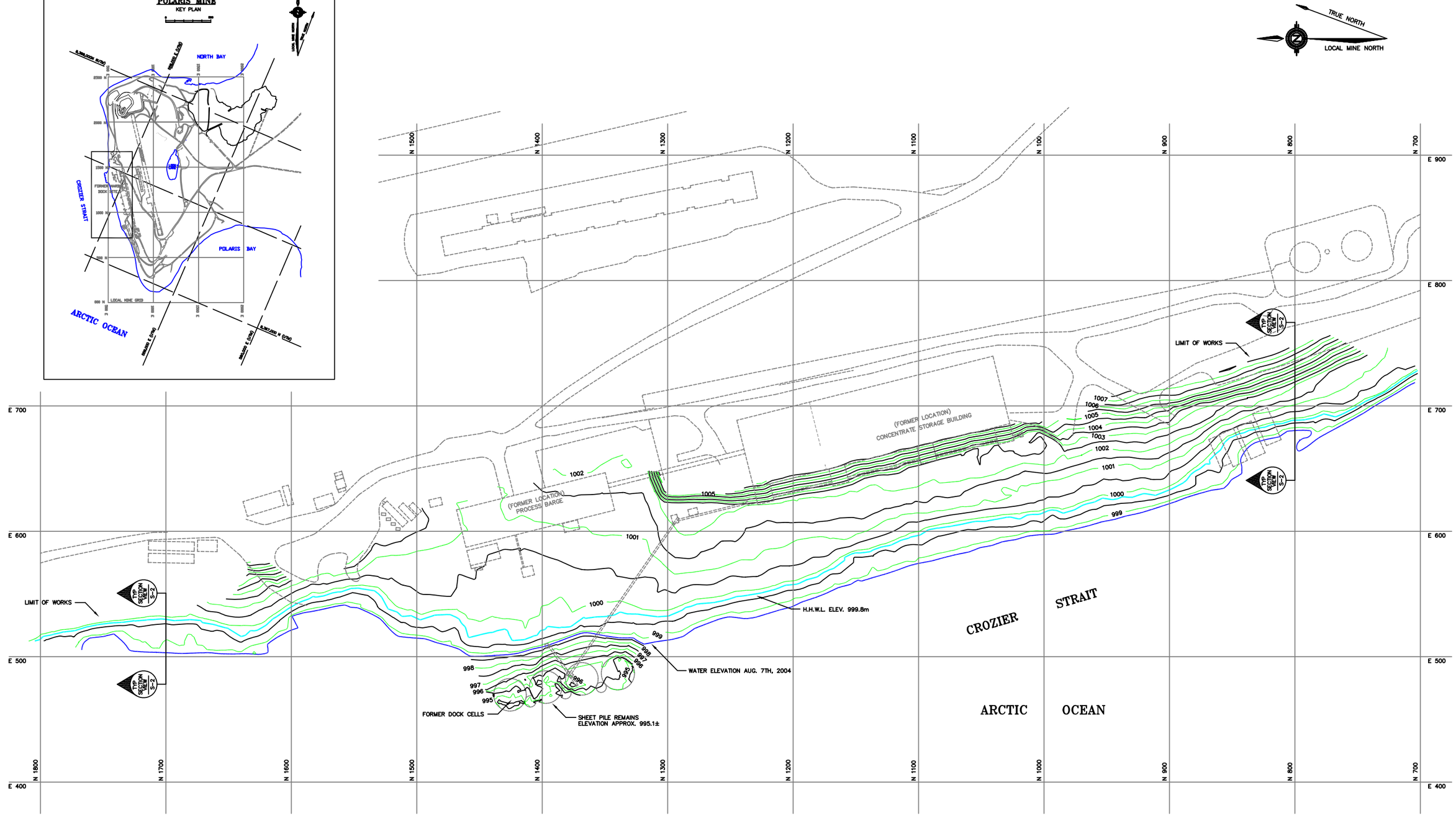
June 17, 2004 – Dam Removal Completed in April but Now Snow Gone, Can See the Finished Slopes and Channel Better

July 10, 2004 – Flow in Decommissioned Dam Channel

August 26, 2004 – Creek Channel Through Dam After Flow Essentially Complete for the Year

APPENDIX 4

PROJECT AS-BUILT DRAWINGS



NOTES:
1. DATA COLLECTED AUGUST, 2004 BY TECK COMINCO REPRESENTATIVE.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVAL = 0.5m.
4. FORMER ROADS AND STRUCTURES SHOWN FOR ORIENTATION ONLY.

LEGEND:
- FORMER LOCATION OF ROADS OR STRUCTURES
- WATER ELEVATION AUG. 7TH, 2004
- H.H.W.L. ELEV. 999.8m
- LIMIT OF WORKS

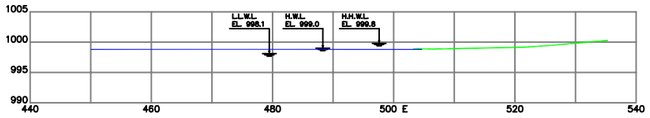
PROJECT:

POLARIS MINE CLOSURE DECOMMISSIONING OF DOCK

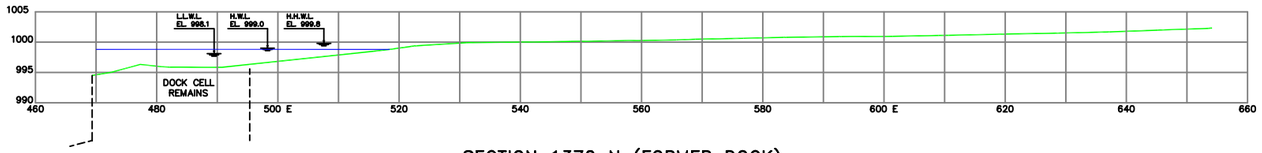
DRAWING:

ASBUILT DRAWING PLAN VIEW

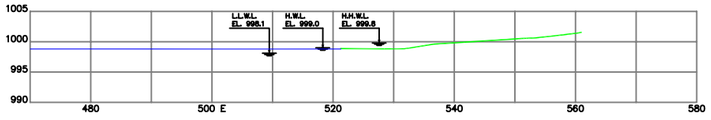
DRAWN BY: T. M. TECH SERVICES
6-355-2
DATE: DEC, 2005
CLIENT: teckcominco
SCALE: 1:1500 METRIC
FIGURE No. PM 2005 DOCK
SHEET: 1 OF 2



SECTION 1700 N



SECTION 1370 N (FORMER DOCK)



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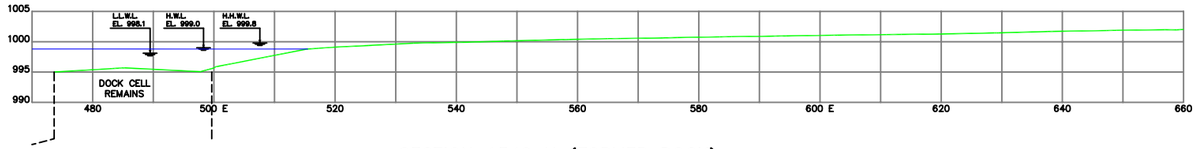
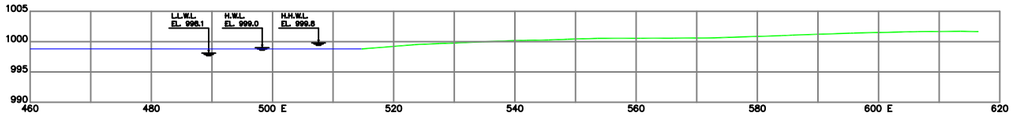
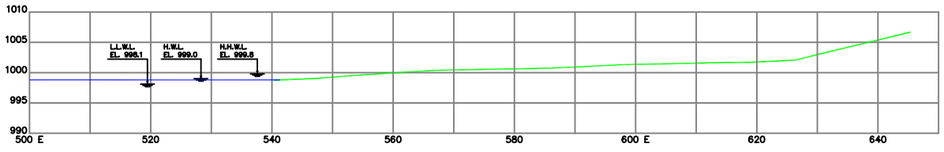


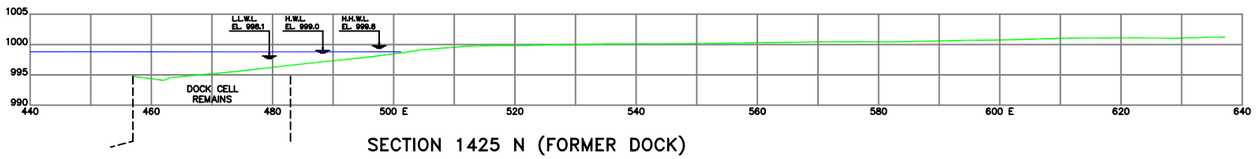
SECTION 1340 N (FORMER DOCK)



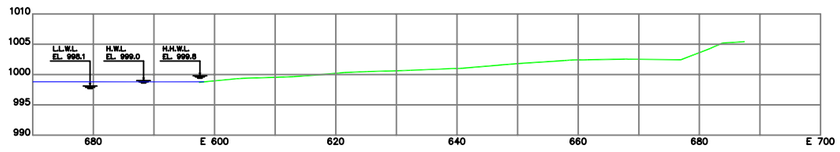
SECTION 1500 N



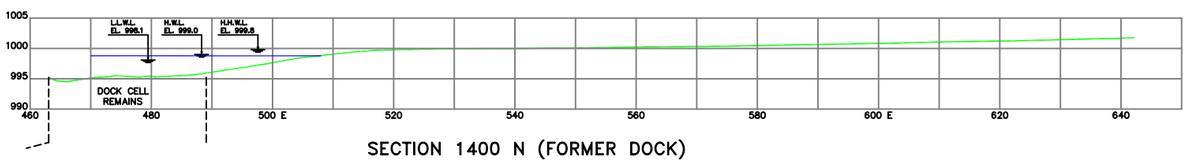
SECTION 1200 N



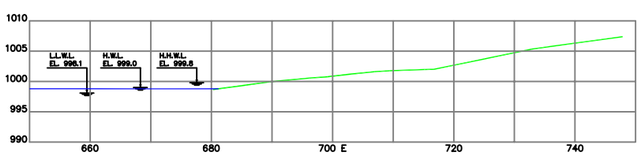
SECTION 1425 N (FORMER DOCK)



SECTION 1000 N



SECTION 1400 N (FORMER DOCK)



SECTION 800 N

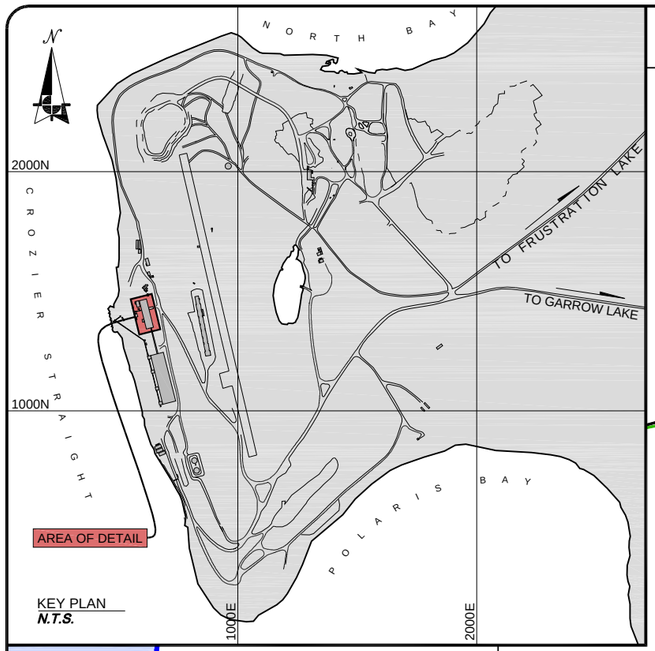
NOTES:
1. DATA COLLECTED AUGUST, 2004 BY TECK COMINCO REPRESENTATIVE.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.

LEGEND:
- WATER ELEVATION AUG. 7TH, 2004
- RESLOPED SURFACE

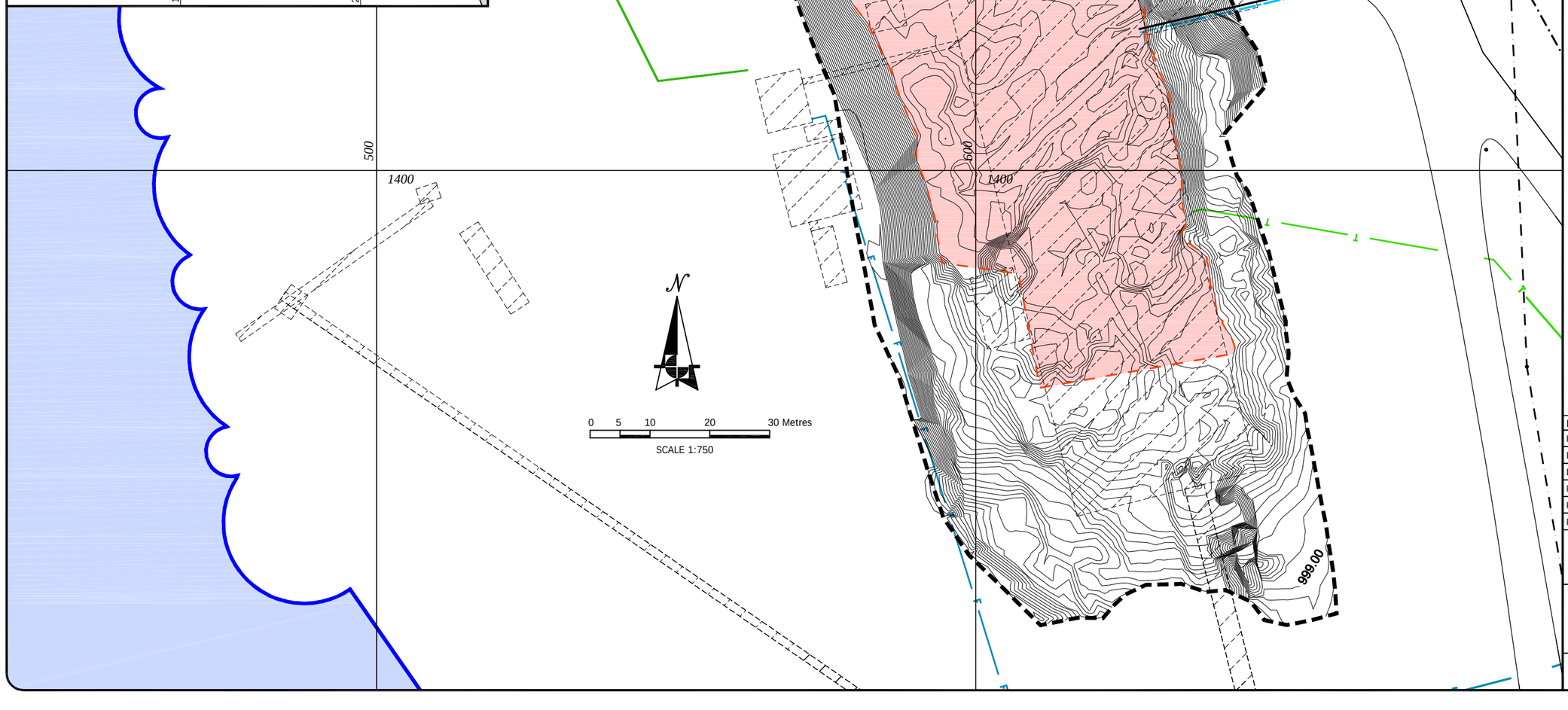
PROJECT:
POLARIS MINE CLOSURE
DECOMMISSIONING OF DOCK

DRAWING:
ASBUILT DRAWING
SECTION VIEWS

DRAWN BY: T. M. TECH SERVICES
6-355-2
DATE: DEC, 2005
CLIENT: teckcominco
SCALE: 1:500 METRIC
FIGURE No.
SHEET:
PM | 2005 | DOCK | 2 of 2



KEY PLAN
N.T.S.



LEGEND:

- 2003 LIMIT OF BARGE EXCAVATION
- EXCAVATED BARGE CONTOURS (0.2m)
- BETWEEN OCT. 12/03 & OCT. 31/03, 6,300 sq. m. OF GARROW DAM CORE MATERIAL PLACED AT THE BASE OF EXCAVATION. 31,500 sq. m. OF CLEAN SAND & GRAVEL ALSO PLACED IN THIS AREA BETWEEN OCT. 12/03 & OCT 31/03. A FURTHER 25,200 sq. m. OF CLEAN SAND & GRAVEL USED TO BACKFILL THE EXCAVATION AFTER OCT. 31/03
- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- WATER LINE
- OVERHEAD POWER LINE
- POWER POLE

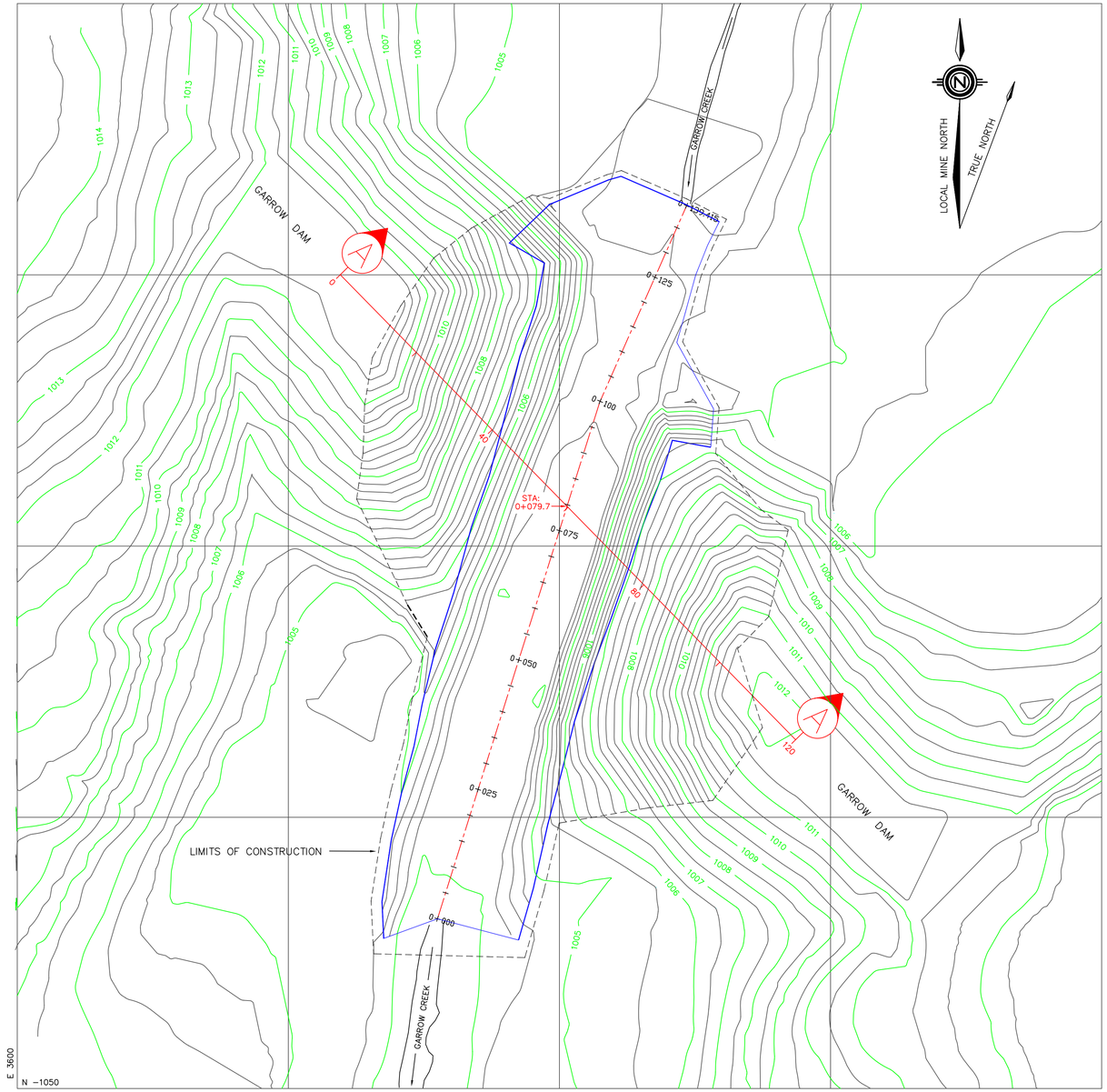
DRAWING INFORMATION:	
REVIEWED BY:	AL
DRAWN BY:	CHARONE
DATE ISSUED:	ISSUED – MAY 25, 2005
PROJECT NUMBER:	40–137
FILE NAME:	40137–BARGE–2003 BACKFILL.DWG
REVISION:	0

POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

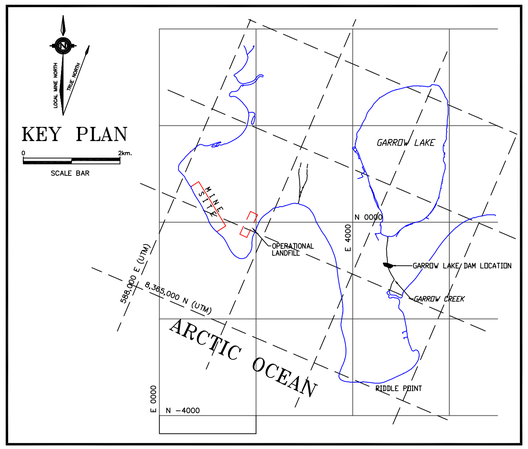
2003 BARGE BACKFILL - FINAL DISPOSAL LOCATION OF GARROW DAM CORE MATERIAL

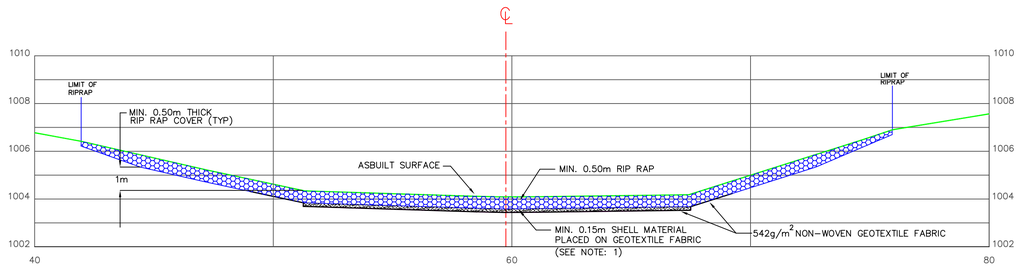
Gartner Lee

Figure No.
40137-BARGE-1



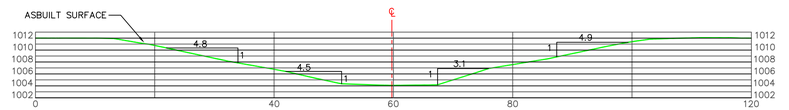
SCALE 1:500





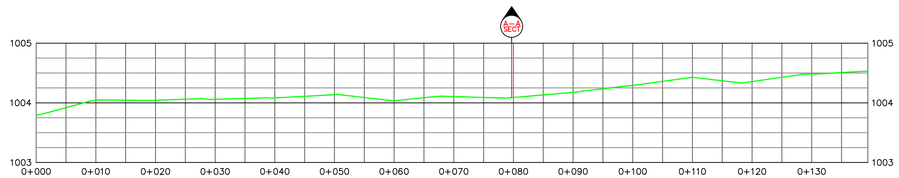
ASBUILT CHANNEL DETAILS (SECTION A-A)

SCALE 1:125



ASBUILT SECTION A-A

SCALE 1:500



ASBUILT ℄ CHANNEL PROFILE

SCALE ~ HORZ. 1:500
VERT. 1:50

NOTES:
1. CHANNEL EXCAVATION DEPTH TO 0.15m BELOW ORIGINAL GROUND AND EXISTING SHELL MATERIAL. AND TO BASE OF DAM KEY TRENCH UNDER FROZEN CORE AND SATURATED SHELL MATERIAL.
2. DATA COLLECTED JUNE 18, 2004 BY TECK COMINCO REPRESENTATIVE.
3. ELEVATIONS REFER TO LOCAL MINE DATUM.
4. CONTOUR INTERVALS = 0.25m. WITHIN CONSTUCTION LIMITS
   0.50m. OUTSIDE CONSTUCTION LIMITS

LEGEND:
- LIMITS OF CONSTRUCTION
- LIMITS OF CHANNEL IMPROVEMENTS

PROJECT:

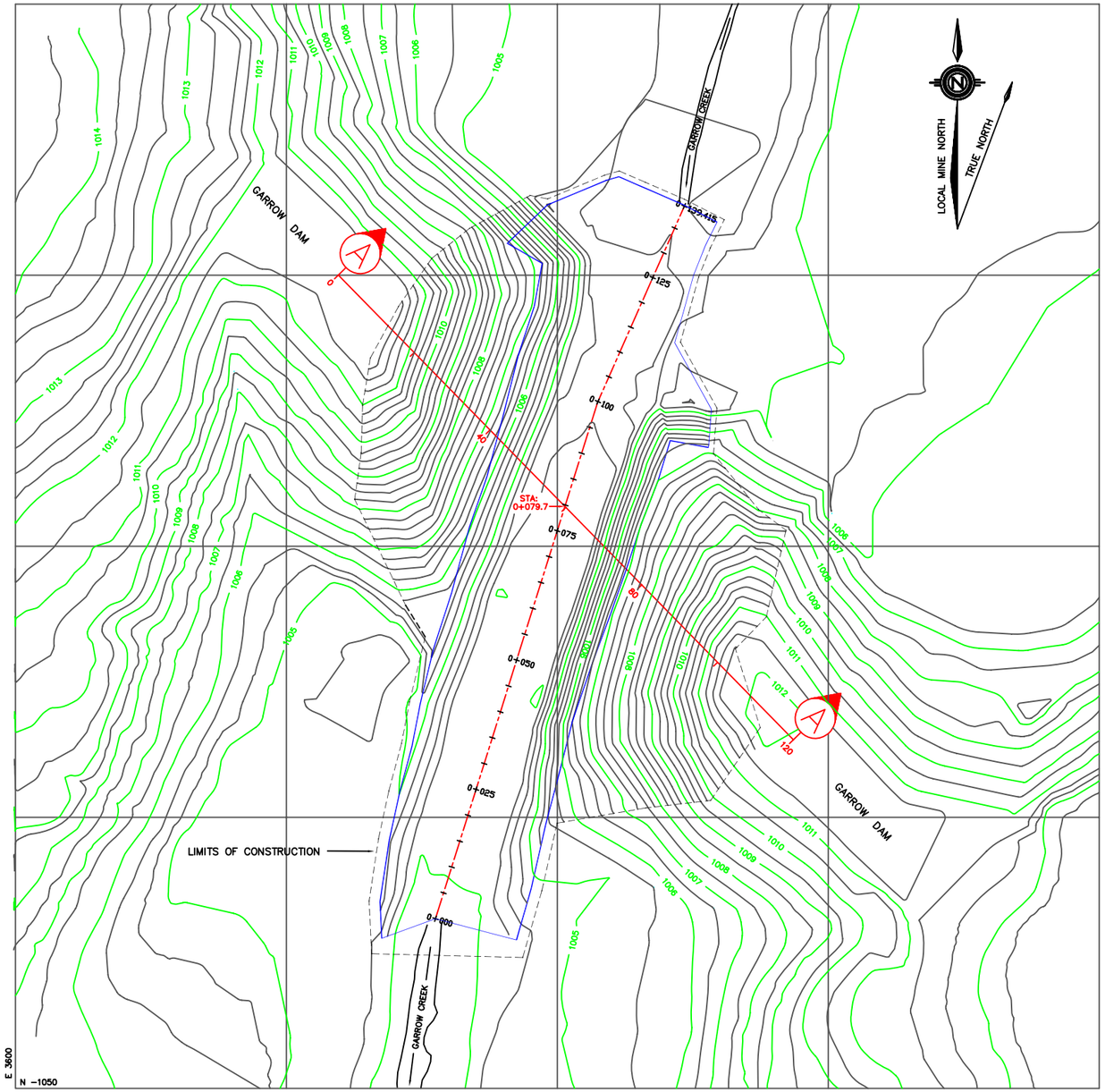
POLARIS MINE, NUNAVUT
GARROW LAKE DAM DECOMMISSIONING

DRAWING:

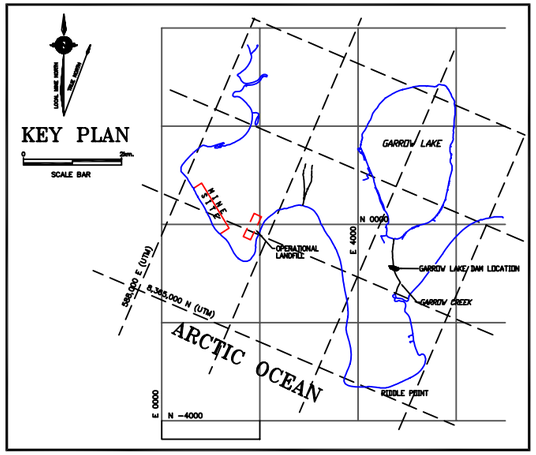
ASBUILT DRAWING
PLAN AND SECTION VIEWS

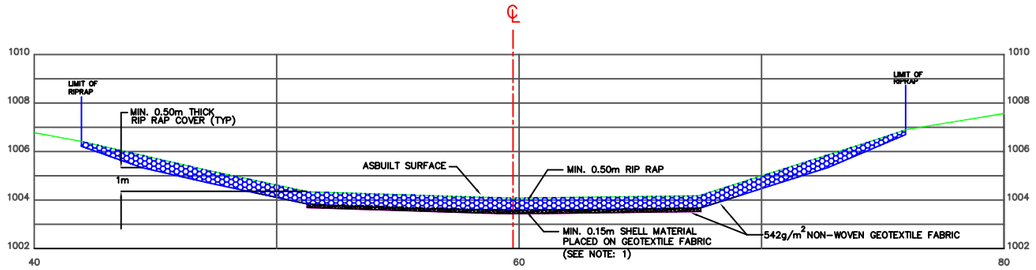
DRAWN BY: T. M. TECH SERVICES
6-354-1
DATE: FEBRUARY 22, 2006
CLIENT: teckcominco
SCALE: AS NOTED
FIGURE No.
SHEET:

PM	2006	G-DAM	1 OF 1



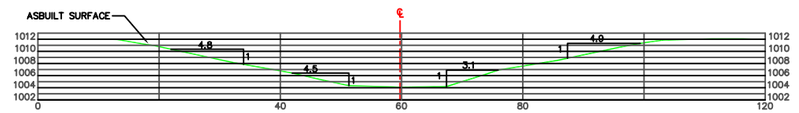
SCALE 1:500





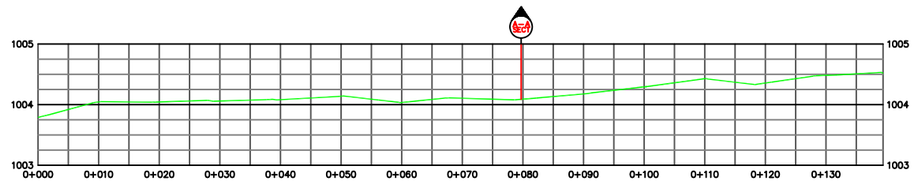
ASBUILT CHANNEL DETAILS (SECTION A-A)

SCALE 1:125



ASBUILT SECTION A-A

SCALE 1:500



ASBUILT ℄ CHANNEL PROFILE

SCALE ~ HORZ. 1:500
VERT. 1:50

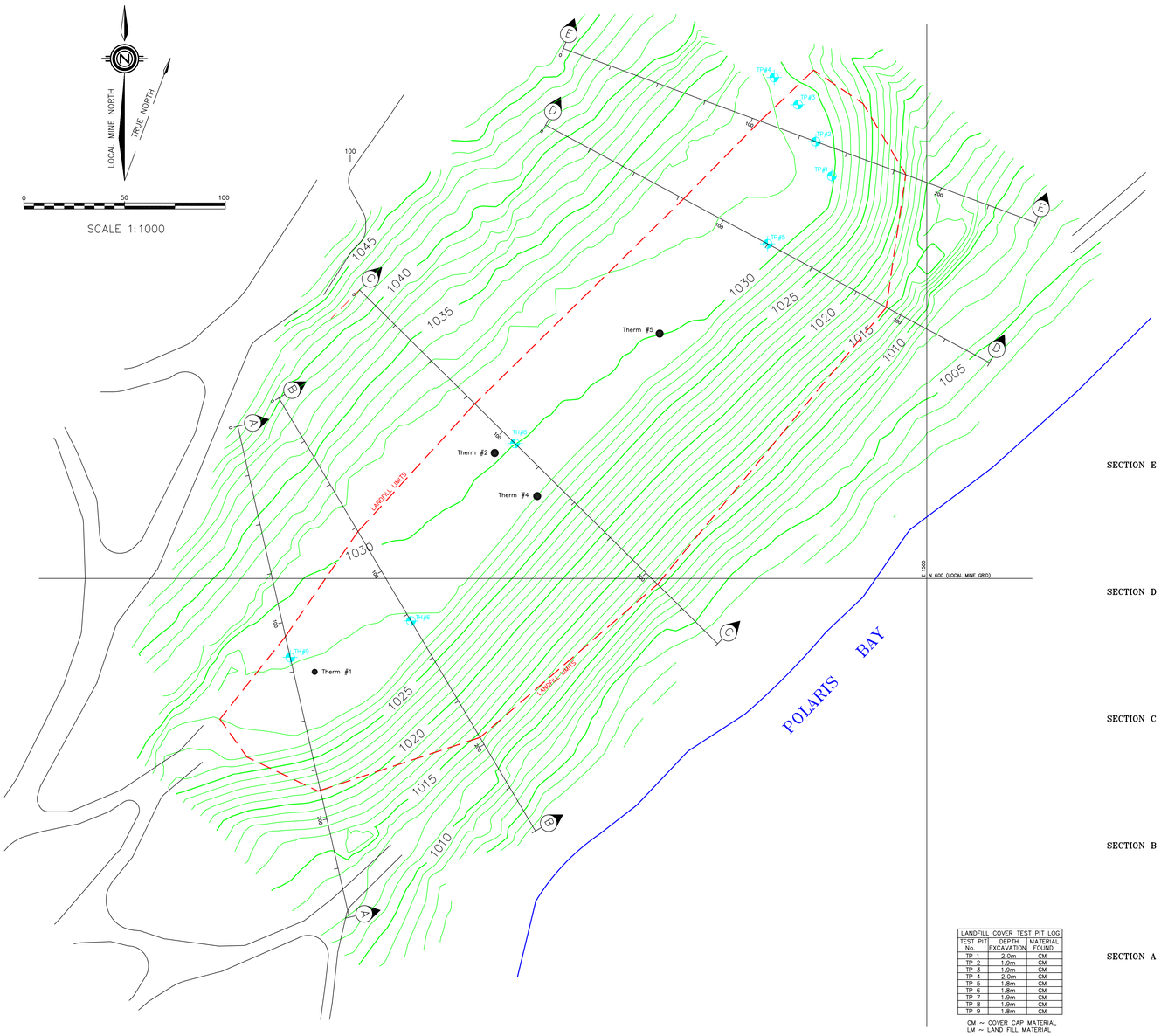
NOTES:
1. CHANNEL EXCAVATION DEPTH TO 0.15m BELOW ORIGINAL GROUND AND EXISTING SHELL MATERIAL AND TO BASE OF DAM KEY TRENCH UNDER FROZEN CORE AND SATURATED SHELL MATERIAL.
2. DATA COLLECTED JUNE 18, 2004 BY TECK COMINCO REPRESENTATIVE.
3. ELEVATIONS REFER TO LOCAL MINE DATUM.
4. CONTOUR INTERVALS = 0.25m. WITHIN CONSTUCTION LIMITS
   0.50m. OUTSIDE CONSTUCTION LIMITS

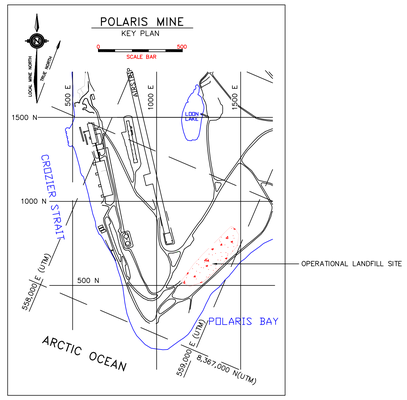
LEGEND:
- LIMITS OF CONSTRUCTION
- LIMITS OF CHANNEL IMPROVEMENTS

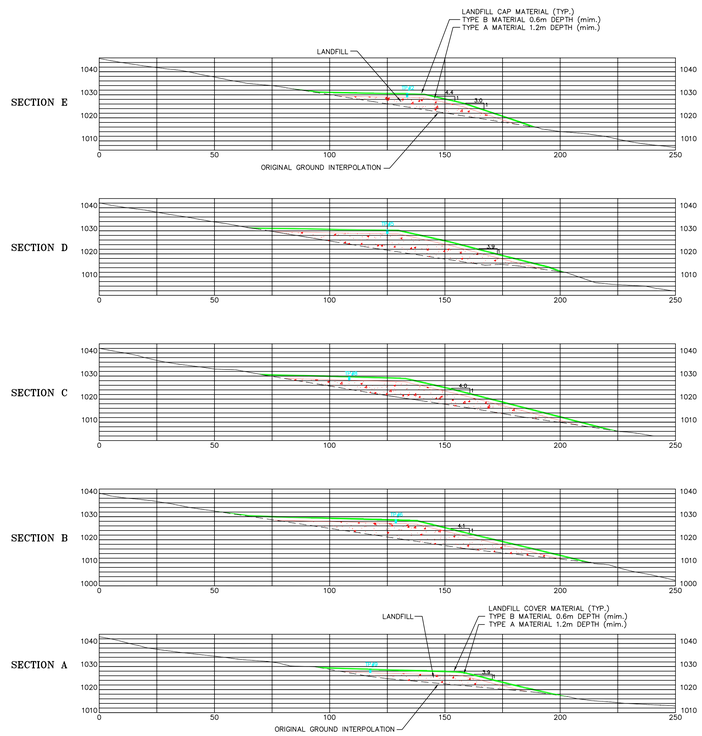
PROJECT:
POLARIS MINE, NUNAVUT
GARROW LAKE DAM DECOMMISSIONING

DRAWING:
ASBUILT DRAWING
PLAN AND SECTION VIEWS

DRAWN BY: T. M. TECH SERVICES
6-354-1
DATE: FEBRUARY 22, 2006
CLIENT: teckcominco
SCALE: AS NOTED
FIGURE No.: PM | 2006 | G-DAM
SHEET: 1 OF 1







LANDFILL COVER TEST PIT LOG		
TEST PIT No.	DEPTH EXCAVATION	MATERIAL FOUND
TP 1	2.0m	CM
TP 2	1.9m	CM
TP 3	1.9m	CM
TP 4	2.0m	CM
TP 5	1.8m	CM
TP 6	1.8m	CM
TP 7	1.9m	CM
TP 8	1.9m	CM
TP 9	1.8m	CM

CM ~ COVER CAP MATERIAL
LM ~ LAND FILL MATERIAL

No.	REVISION	DATE
5		
4		
3	.	.
2	.	.
1	.	.

NOTES:
1. DATA COLLECTED JUNE, 2004 BY TECK COMINCO REPRESENTATIVE.
2. ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVAL = 1 METER.

LEGEND:
- ● Therm #1 ~ THERMISTOR LOCATION.
- TH#9 ~ LANDFILL COVER TEST HOLE LOCATION.
- TP#5 ~ LANDFILL COVER TEST HOLE LOCATION AND DEPTH ON SECTION VIEW.
- — — — LIMITS OF RESLOPED LANDFILL.

PROJECT:

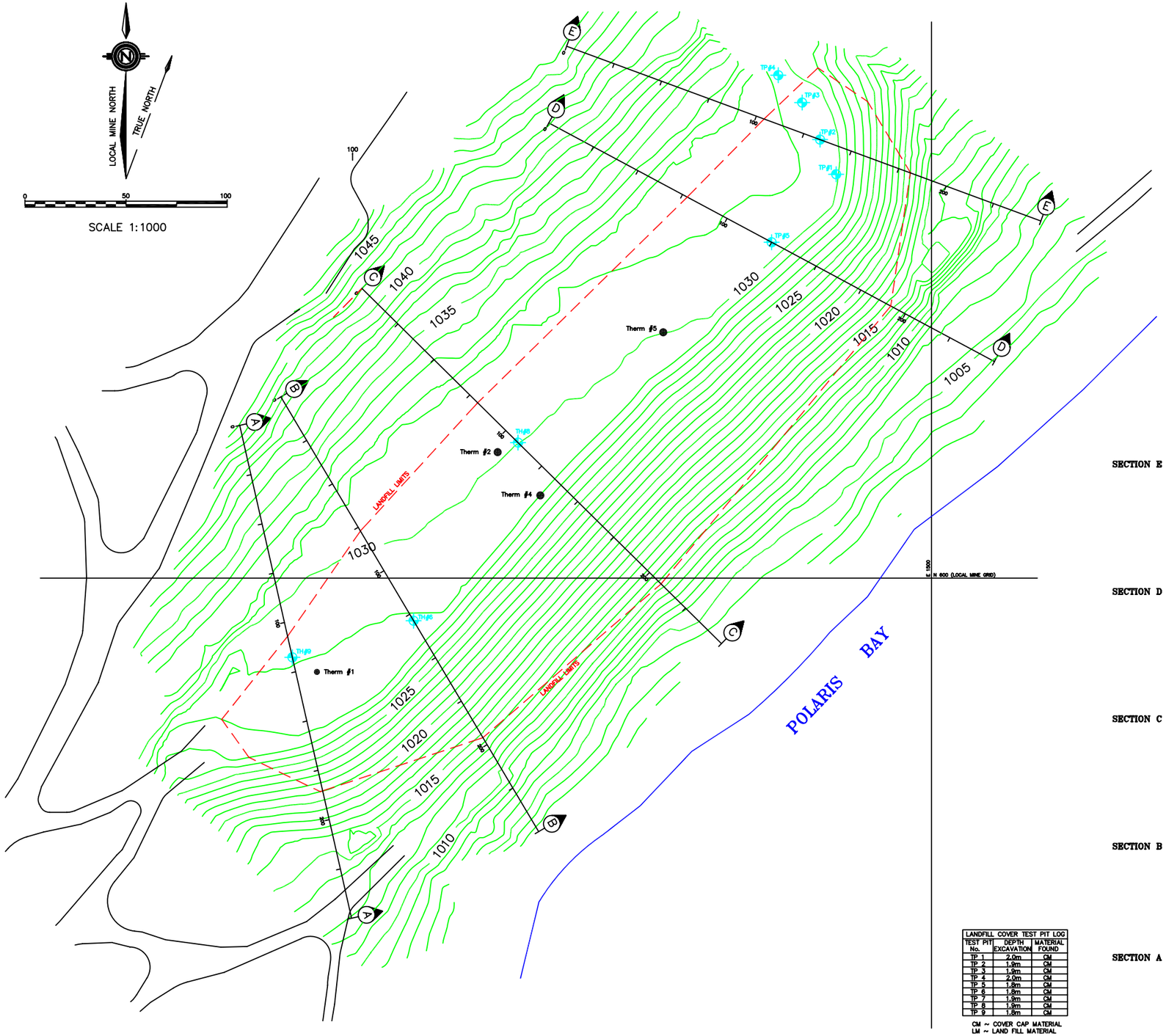
POLARIS MINE
NUNAVUT

DRAWING:

AS-BUILT TOPOGRAPHIC PLAN
OPERATIONAL LANDFILL SITE

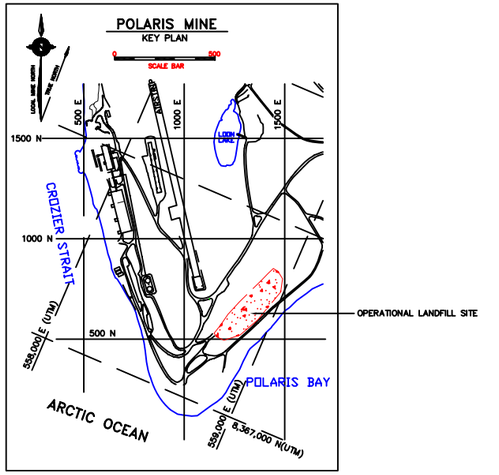
DRAWN BY: T. M. TECH SERVICES
5-348-3
DATE: DEC., 2005
SCALE: 1:1,000 HORZ. 1:1000 VERT.
CLIENT: teckcominco
FIGURE No.: PM | 2005 | OLF
SHEET: 1 of 1

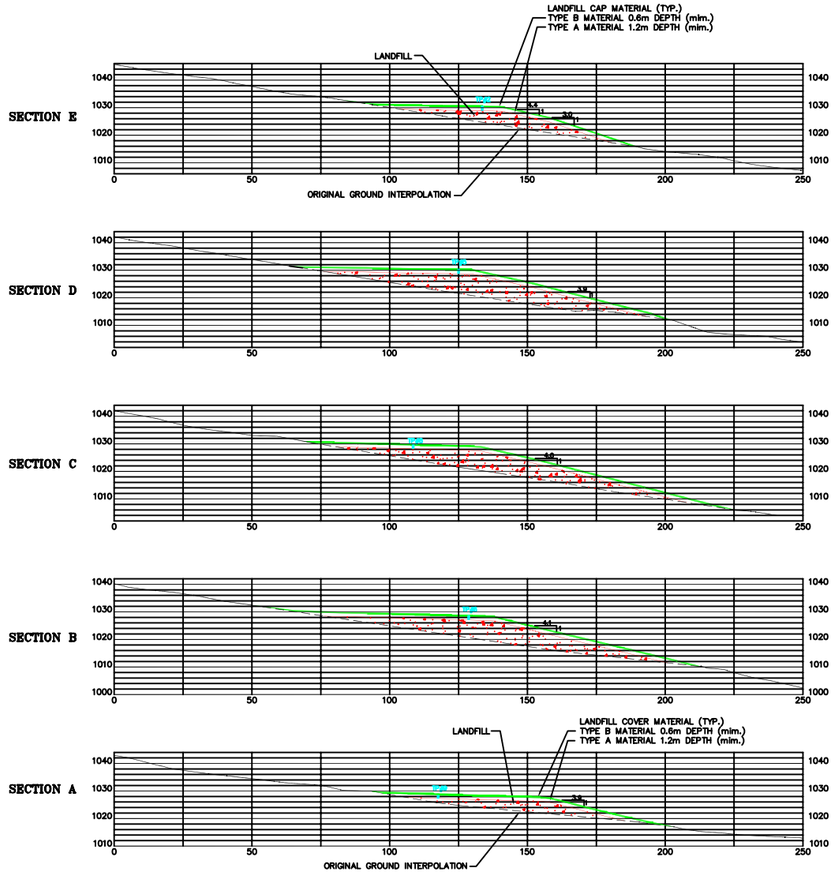
SCALE 1:1000



LANDFILL COVER TEST PIT LOG		
TEST PIT No.	DEPTH EXCAVATION	MATERIAL FOUND
TP 1	2.0m	CM
TP 2	1.9m	CM
TP 3	1.9m	CM
TP 4	2.0m	CM
TP 5	1.8m	CM
TP 6	1.8m	CM
TP 7	1.9m	CM
TP 8	1.9m	CM
TP 9	1.8m	CM

CM ~ COVER CAP MATERIAL
LM ~ LAND FILL MATERIAL





No.	REVISION	DATE
5		
4		
3	.	.
2	.	.
1	.	.

NOTES:
1. DATA COLLECTED JUNE, 2004 BY TECK COMINCO REPRESENTATIVE.
2. ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVAL = 1 METER.

LEGEND:
- Therm #1 ~ THERMISTOR LOCATION.
- TH#9 ~ LANDFILL COVER TEST HOLE LOCATION.
- TP#9 ~ LANDFILL COVER TEST HOLE LOCATION AND DEPTH ON SECTION VIEW.
- LIMITS OF RESLOPED LANDFILL.

PROJECT:

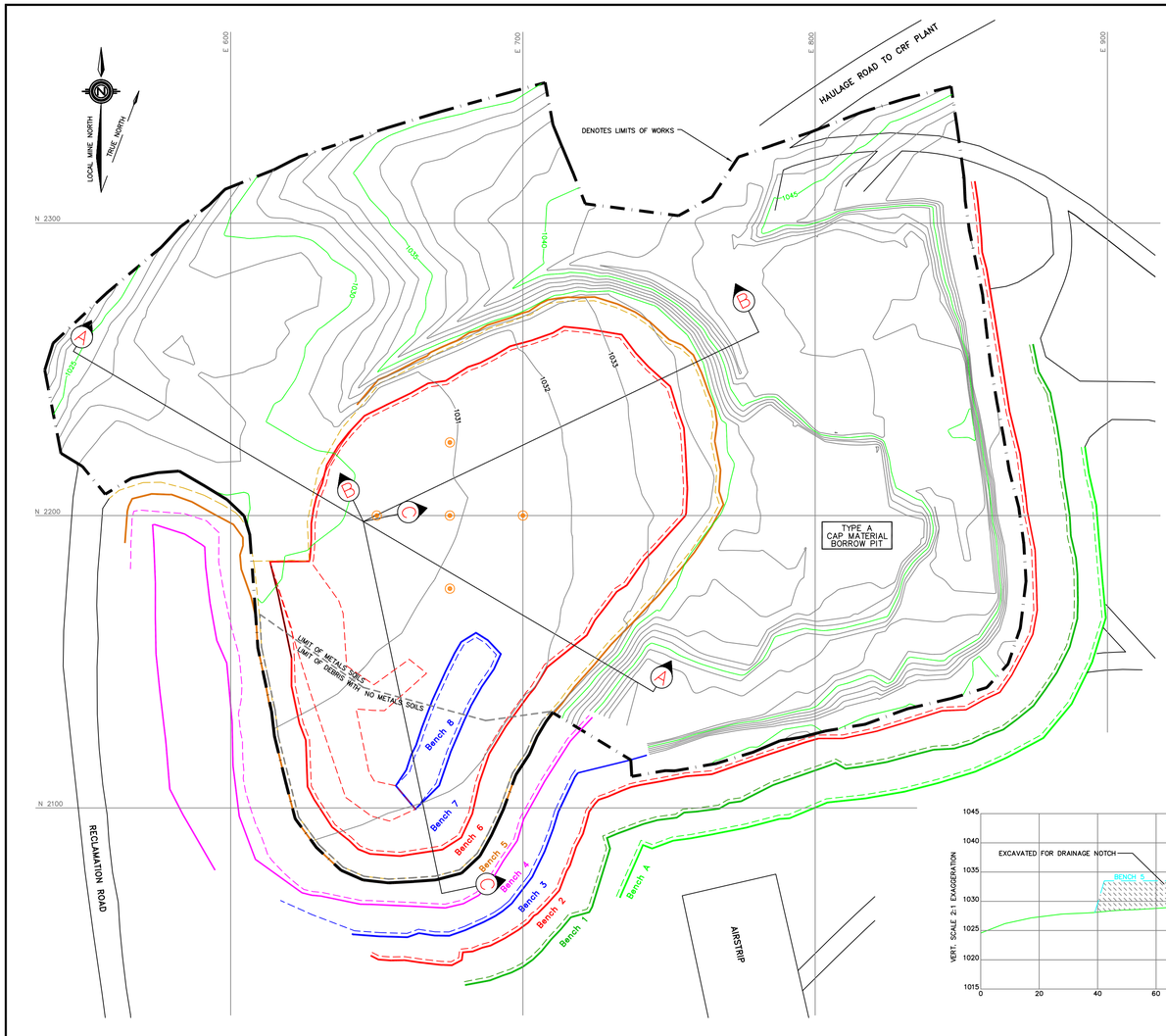
POLARIS MINE
NUNAVUT

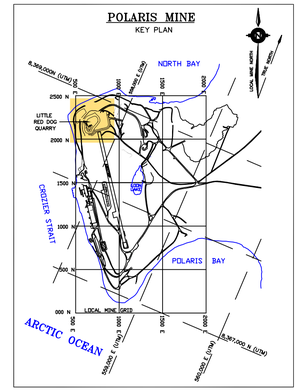
DRAWING:

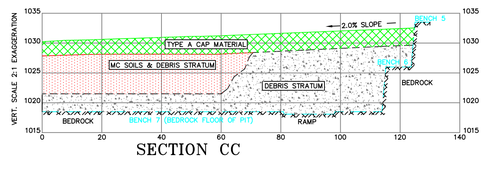
AS-BUILT TOPOGRAPHIC PLAN
OPERATIONAL LANDFILL SITE

DRAWN BY: T. M. TECH SERVICES
5-348-3
DATE: DEC., 2005
SCALE: 1:1,000 HORZ. 1:1000 VERT.
FIGURE No.: PM 2005 OLF
SHEET: 1 OF 1

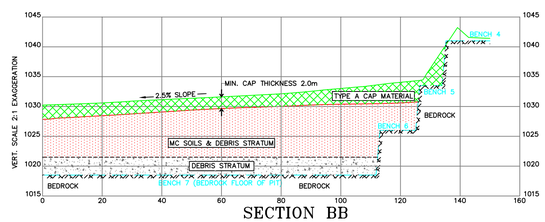
CLIENT: teckcominco



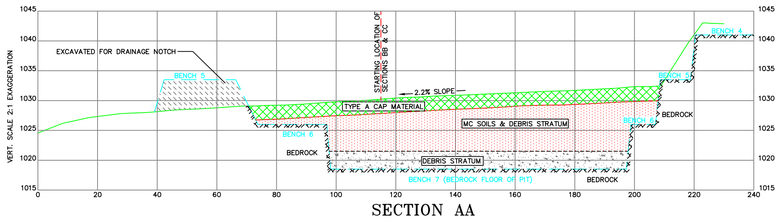




SECTION CC



SECTION BB



SECTION AA

NOTES:
1. DATA COLLECTED AUGUST, 2004 BY TECK COMINCO REPRESENTATIVE.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVAL = 1 METER
4. MC SOILS REFERS TO METALS CONTAMINATED SOILS.
5. DEBRIS REFERS TO BUILDING AND EQUIPMENT DEBRIS.
6. TYPE A CAP MATERIAL SPECIFICATIONS ~ LIMESTONE OR LIMESTONE-DOLOMITE GRAIN SIZE MAX. 300mm SAND, GRAVEL AND COBBLES.

LEGEND:
- DENOTES TOE OF BENCHED BEDROCK SURFACES. DENOTES CREST OF BENCHED BEDROCK SURFACES.
- DENOTES 5m CONTOUR OF RESLOPED NATIVE MATERIAL..
- DENOTES 1m CONTOUR OF RESLOPED NATIVE MATERIAL..
- DENOTES LIMITS OF CONSTRUCTION.
- DENOTES LIMITS OF DEBRIS MATERIAL DUMP THAT DOES NOT CONTAIN METALS CONTAMINATED SOILS.
- DENOTES THERMISTOR LOCATION

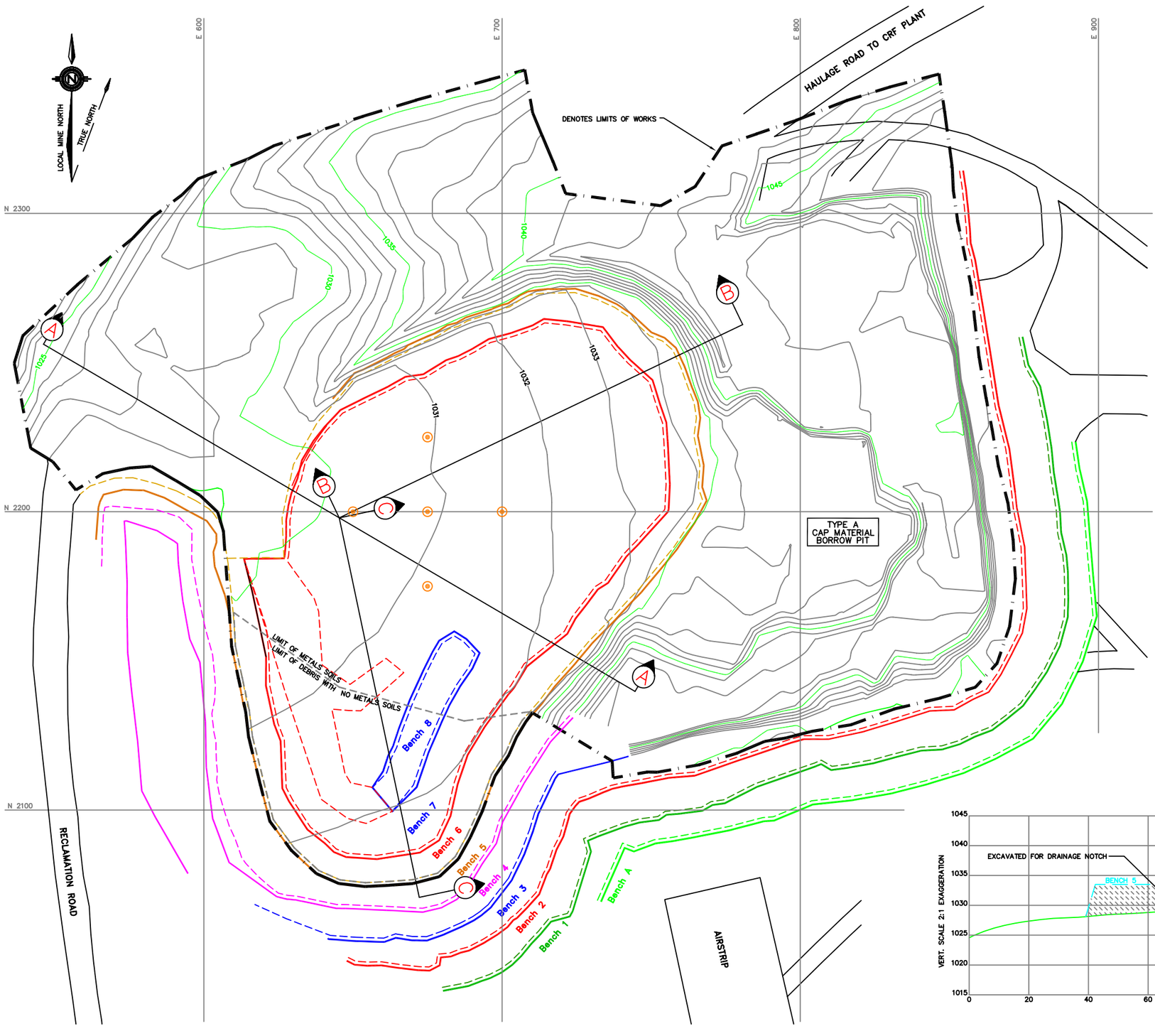
PROJECT:

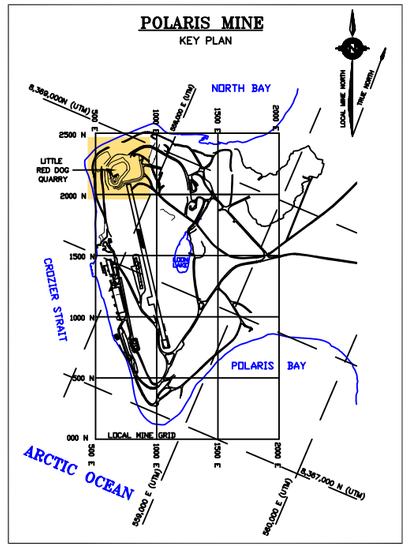
POLARIS MINE CLOSURE

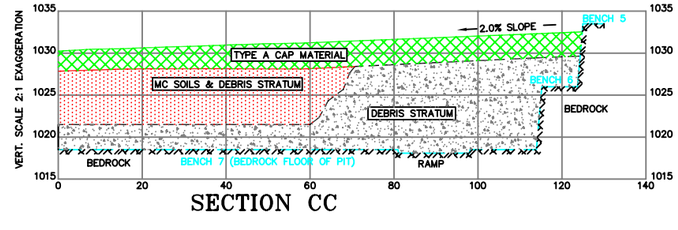
DRAWING:

LITTLE RED DOG QUARRY
LANDFILL ASBUILT DRAWING
PLAN AND SECTION VIEWS

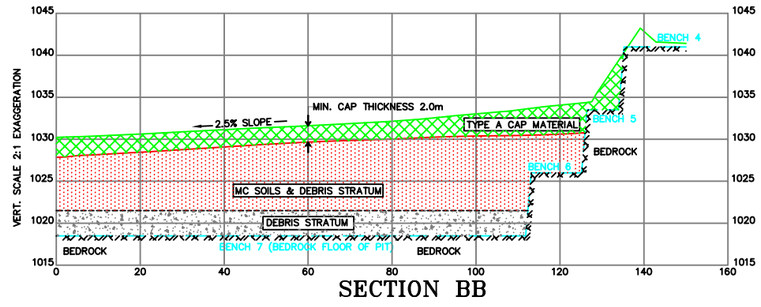
DRAWN BY: T. M. TECH SERVICES	CLIENT: teckcominco
6-354-2	
DATE: DECEMBER, 2005	SCALE: 1:750 (Metric)
FIGURE No. PM 2005 LRD	SHEET: 1 OF 1



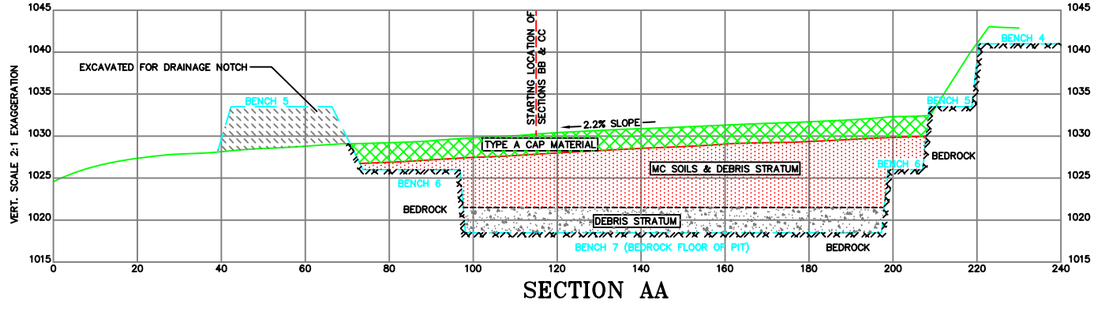




SECTION CC



SECTION BB



SECTION AA

NOTES:
1. DATA COLLECTED AUGUST, 2004 BY TECK COMINCO REPRESENTATIVE.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVAL = 1 METER
4. MC SOILS REFERS TO METALS CONTAMINATED SOILS.
5. DEBRIS REFERS TO BUILDING AND EQUIPMENT DEBRIS.
6. TYPE A CAP MATERIAL SPECIFICATIONS ~ LIMESTONE OR LIMESTONE-DOLOMITE GRAIN SIZE MAX. 300mm SAND, GRAVEL AND COBBLES.

LEGEND:
- DENOTES TOE OF BENCHED BEDROCK SURFACES. DENOTES CREST OF BENCHED BEDROCK SURFACES.
- DENOTES 5m CONTOUR OF RESLOPED NATIVE MATERIAL.. DENOTES 1m CONTOUR OF RESLOPED NATIVE MATERIAL..
- DENOTES LIMITS OF CONSTRUCTION.
- DENOTES LIMITS OF DEBRIS MATERIAL DUMP THAT DOES NOT CONTAIN METALS CONTAMINATED SOILS.
- DENOTES THERMISTOR LOCATION

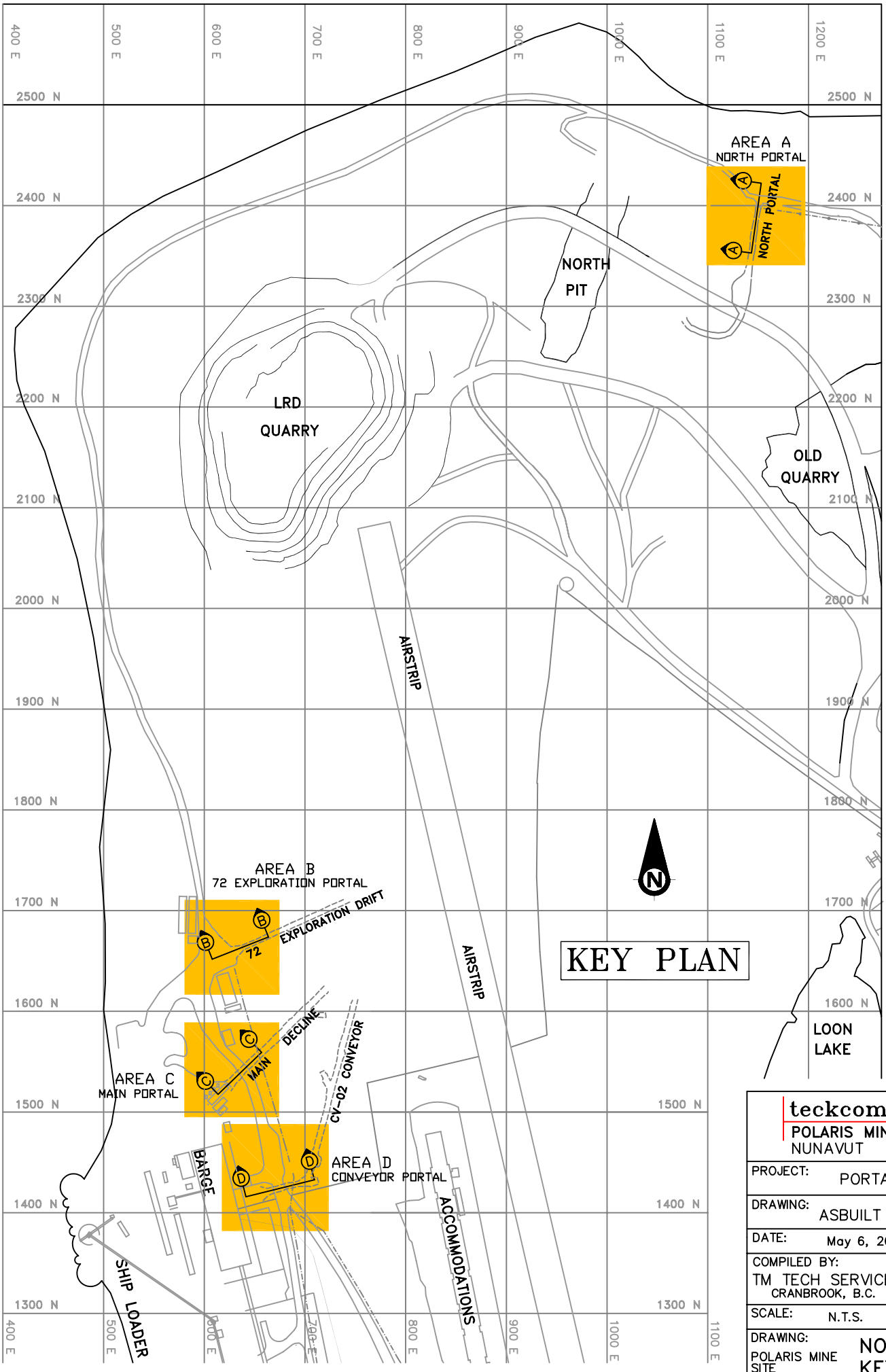
PROJECT:

POLARIS MINE CLOSURE

DRAWING:

LITTLE RED DOG QUARRY LANDFILL ASBUILT DRAWING PLAN AND SECTION VIEWS

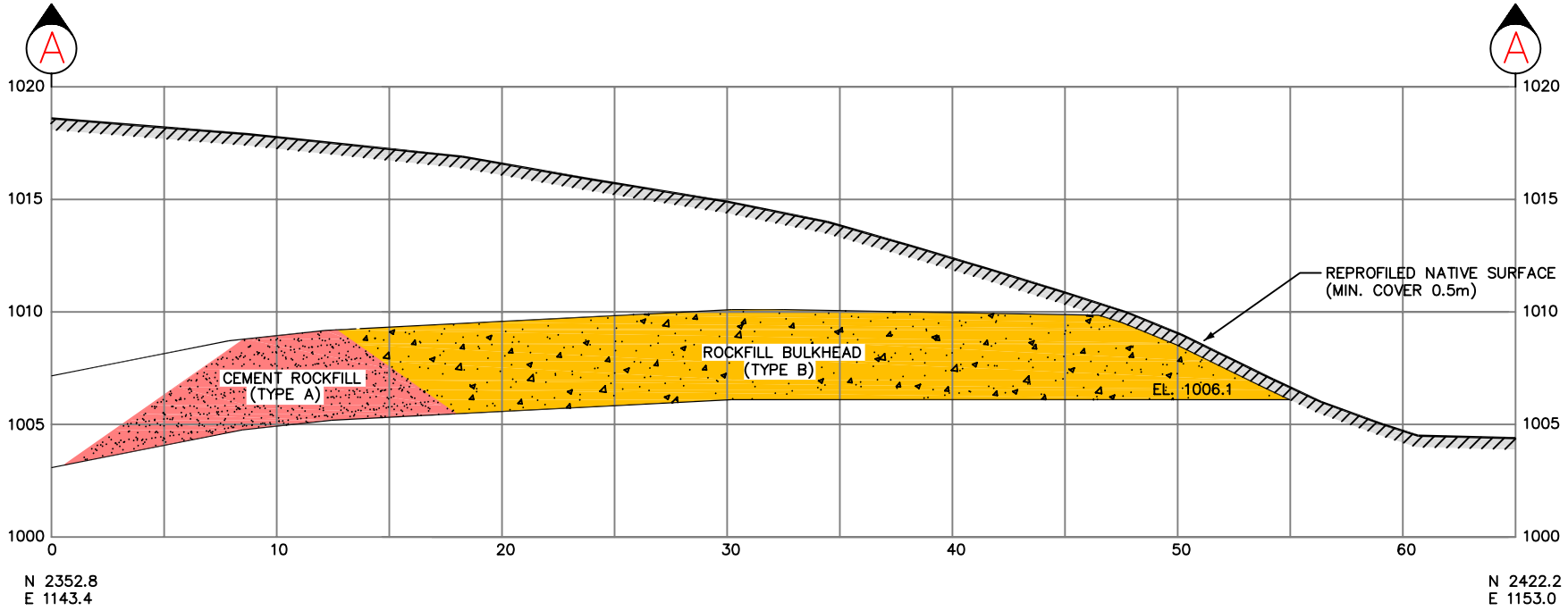
DRAWN BY: T. M. TECH SERVICES	CLIENT: teckcominco
6-354-2	
DATE: DECEMBER, 2005	SCALE: 1:750 (Metric)
FIGURE No.	SHEET:
PM 2005 LRD	1 OF 1



teckcominco

POLARIS MINE
NUNAVUT

PROJECT:	PORTAL PLUGS
DRAWING:	ASBUILT SECTIONS
DATE:	May 6, 2005
COMPILED BY:	TM TECH SERVICES CRANBROOK, B.C.
SCALE:	N.T.S.
DRAWING:	NO. 1 KEY PLAN
POLARIS MINE SITE	



SECTION AA
NORTH PORTAL

teckcominco
POLARIS MINE
NUNAVUT

PROJECT: PORTAL PLUGS

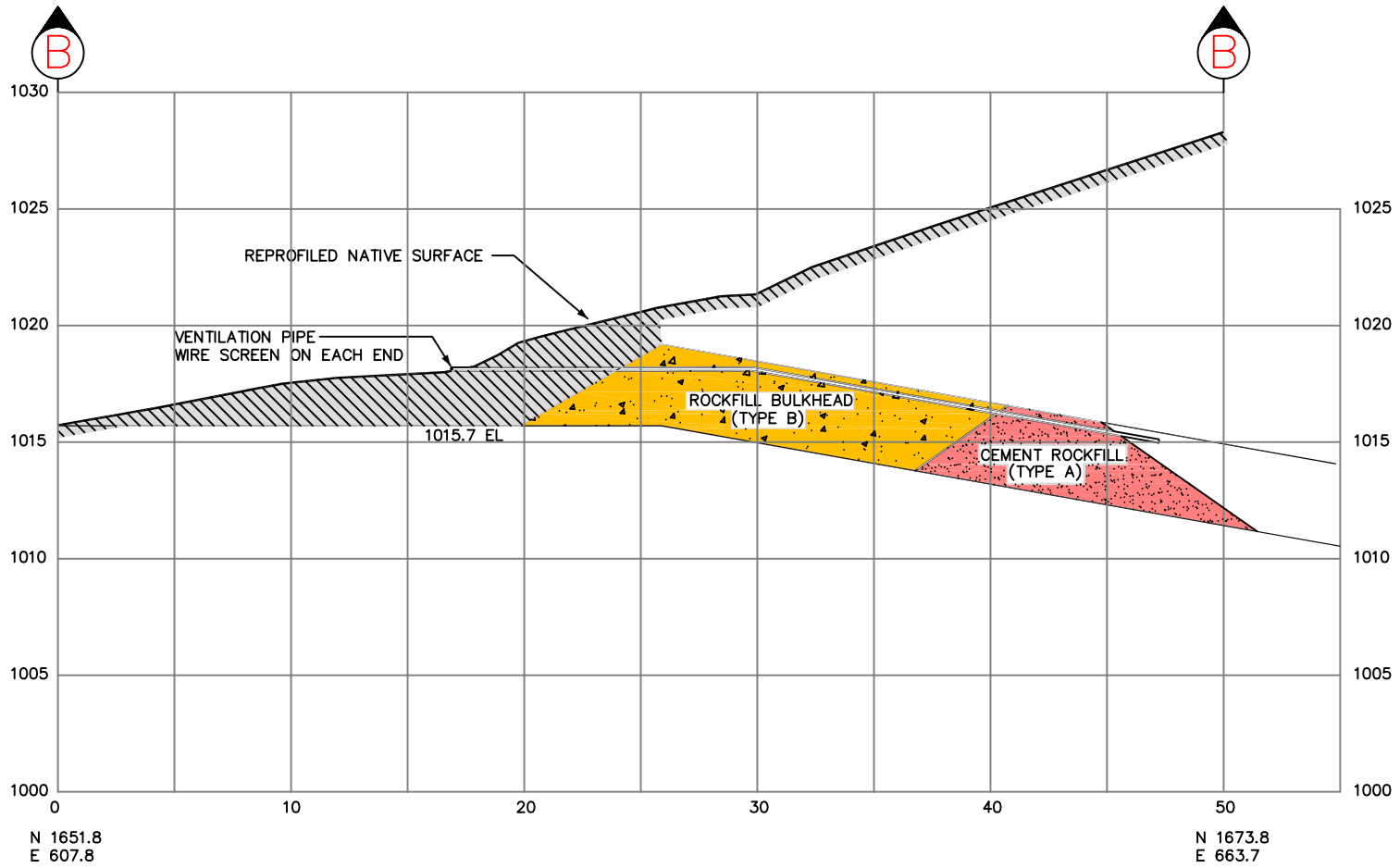
DRAWING: ASBUILT SECTIONS

DATE: May 6, 2005

COMPILED BY:
TM TECH SERVICES
CRANBROOK, B.C.

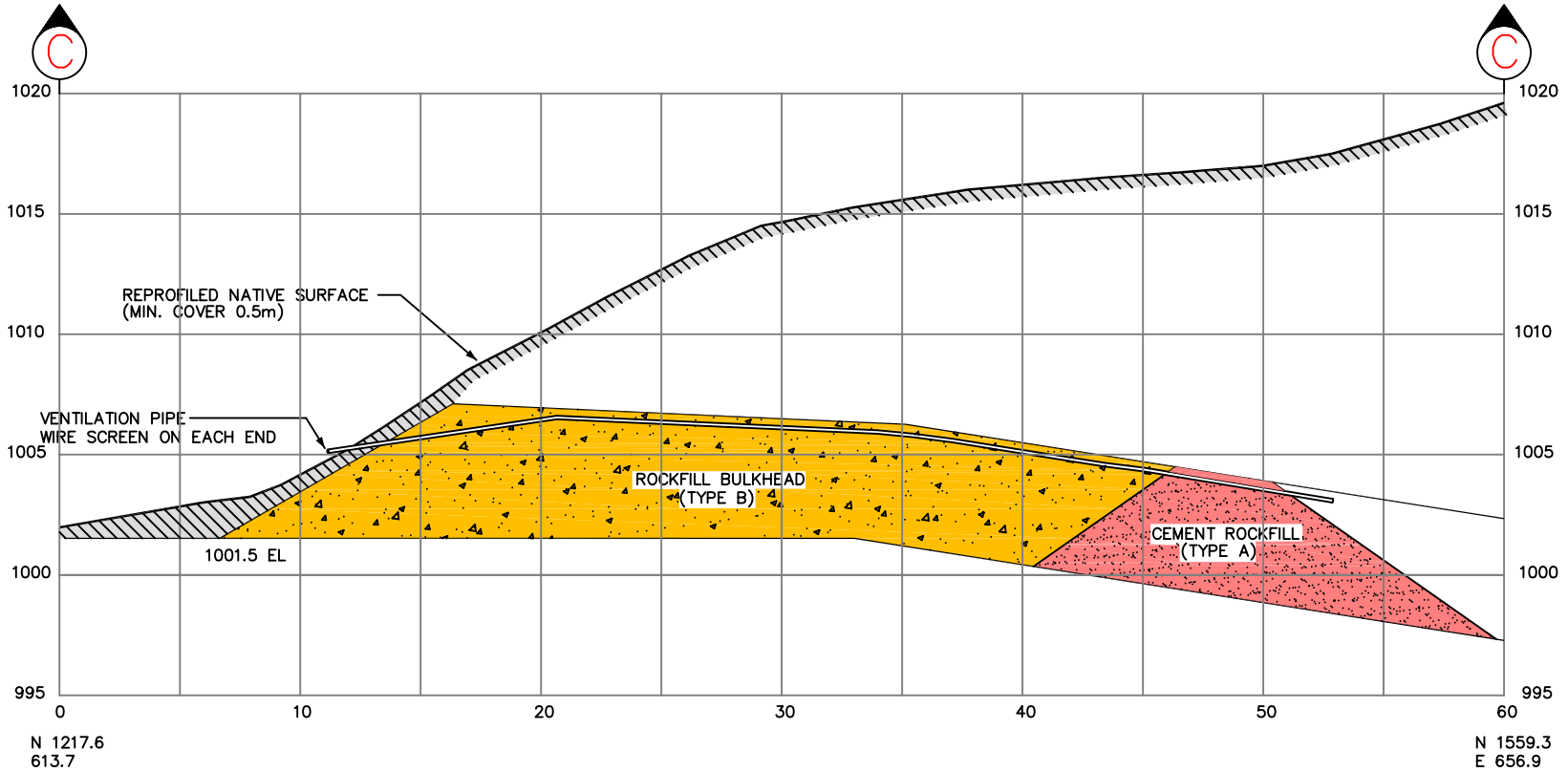
SCALE: 1:300 (metric)

DRAWING:
NO. 2
NORTH PORTAL SECT-AA



SECTION BB
72 EXPLORATION PORTAL

teckcominco	
POLARIS MINE NUNAVUT	
PROJECT:	PORTAL PLUGS
DRAWING:	ASBUILT SECTIONS
DATE:	May 6, 2005
COMPILED BY:	TM TECH SERVICES CRANBROOK, B.C.
SCALE:	1:300 (metric)
DRAWING:	72 EXPLORATION PORTAL No. 3 SECT-BB



SECTION CC
MAIN PORTAL

teckcominco
POLARIS MINE
NUNAVUT

PROJECT: PORTAL PLUGS

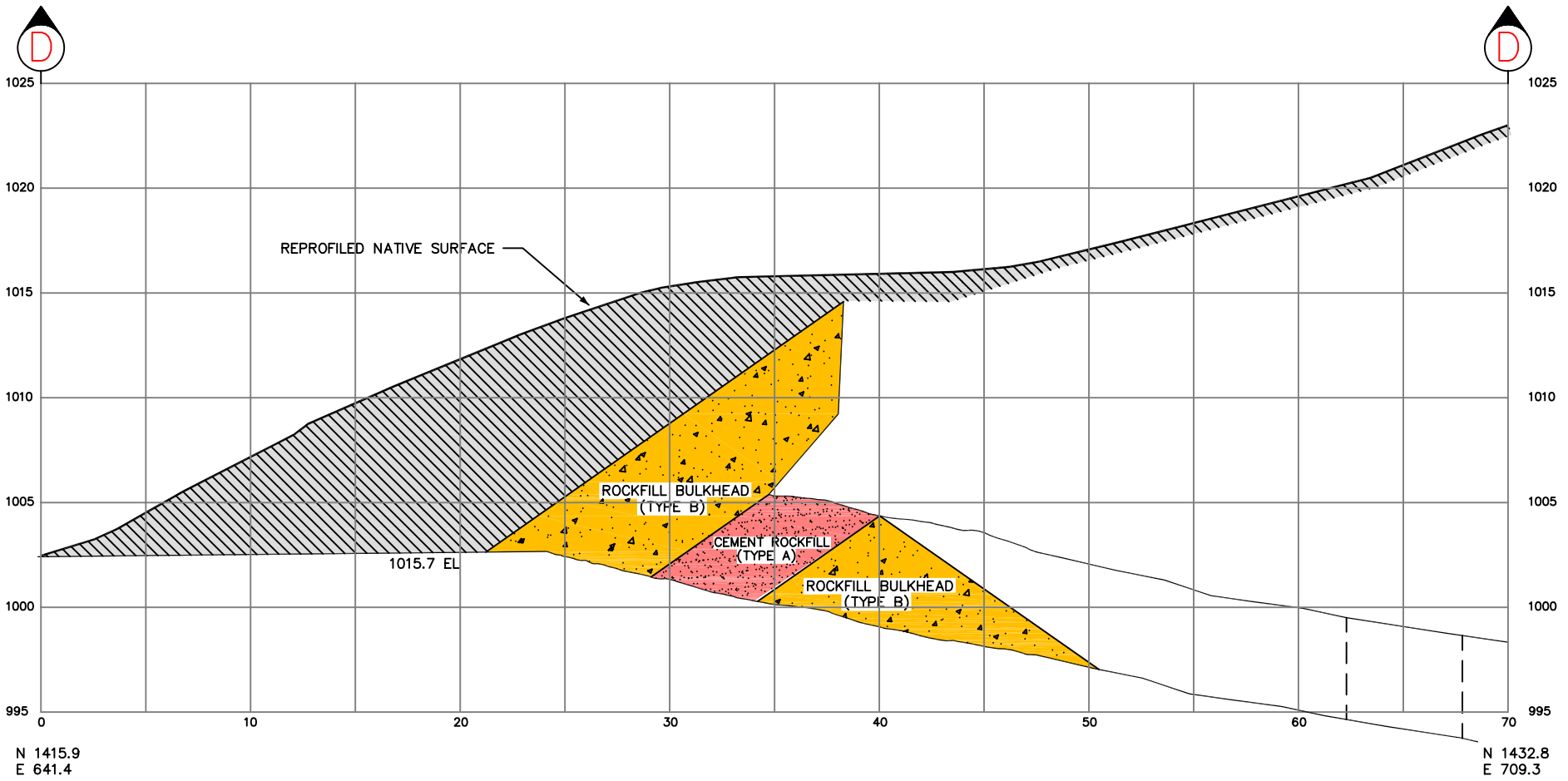
DRAWING: ASBUILT SECTIONS

DATE: May 6, 2005

COMPILED BY:
TM TECH SERVICES
CRANBROOK, B.C.

SCALE: 1:300 (metric)

DRAWING:
MAIN PORTAL
No. 4
SECT-CC



SECTION DD
CONVEYOR PORTAL

teckcominco
POLARIS MINE
NUNAVUT

PROJECT: PORTAL PLUGS

DRAWING: ASBUILT SECTIONS

DATE: May 6, 2005

COMPILED BY:
TM TECH SERVICES
CRANBROOK, B.C.

SCALE: 1:300 (metric)

DRAWING: No. 5
CONVEYOR PORTAL SECT-DD

APPENDIX 5

CONTAMINATED SOIL REMEDIATION

2004

CLOSE-OUT REPORTS

Contaminated Soil Remediation
2004 Close Out Reports
Polaris Mine, Nunavut

Prepared for
Teck Cominco Limited

Submitted by
Gartner Lee Limited

June 2005

Contaminated Soil Remediation 2004 Close Out Reports Polaris Mine, Nunavut

Prepared for
Teck Cominco Limited

June 2005

Reference: **GLL 50063**

Distribution:
10 Teck Cominco Limited
3 Gartner Lee Limited

Gartner Lee Limited

June 22, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 50063 - Contaminated Soil Remediation 2004 Close Out Reports
Polaris Mine, Nunavut

On behalf of Gartner Lee Limited, I am pleased to submit the remaining close out reports on the areas of contaminated soil remediated at the Polaris Mine site. These close out reports serve to document the remedial activities that were undertaken and the sample results that verify completion of activities. The areas remediated were identified as Areas of Potential Environmental Concern in the *Polaris Mine Decommissioning and Reclamation Plan*, March 2001. The areas have been remediated to the meet the approved Polaris Mine site specific remedial targets.

Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* illustrates those areas that were remediated in 2003 and reported previously in the February 16, 2004 Report *23305 – Contaminated Soil Remediation 2003 Close Out Reports, Polaris Mine, Nunavut* (Areas 3, 4, 6, 11, 12, 15, 17, 22, 23, and 24).

Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004* illustrates the areas of contaminated soil remediated subsequently. The results are presented as ten (10) separate appendices to this letter. Each of reports have been subject to detailed peer and management review as follows:

Area 1.	Process Barge, Dr. Dennis Gregor, P.Geol. (NU), Guelph, ON Office Manager
Area 2.	Ship Loading Dock, Dr. Dennis Gregor, P.Geol. (NU)
Area 5.	Accommodation Complex, Robert Dickin, M.Sc., P.Geo. (BC), Burnaby, BC Office Manager, Principal
Areas 7 and 19	Foldaway Buildings, David S. Osmond, B.Sc., R.P.Bio., Principal
Areas 8 and 9:	Tank Farm and Lube Oil Storage, Alistair Kent, P.Eng. (BC), Manager Western Canada Mining Sector
Area 10:	Tailings Pipeline, David S. Osmond, B.Sc., R.P.Bio.
Area 18:	Loon Lake Snow Dump, David S. Osmond, B.Sc., R.P.Bio.

840-7th Avenue SW, Suite 1605, Calgary, Alberta, T2P 3G2 tel 403.262.4299 fax 403.264.8412
www.gartnerlee.com

Area 21:	Firehall, Eric Denholm, B.A.Sc., P.Eng. (NU), Yellowknife, NT Office Manager, Principal
Area 25:	South Shore, Eric Denholm, B.A.Sc., P.Eng. (NU)
Area 26:	North Shore, Dr. Dennis Gregor, P.Geol. (NU)

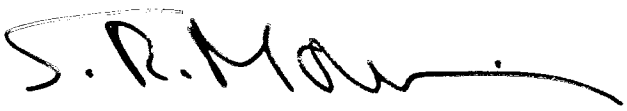
There are four (4) additional areas that were presented as "Areas of Potential Environmental Concern" in the Polaris Mine Decommissioning and Reclamation Plan, March 2001. These are presented as the following areas on Figures 1 and 2 as Areas 13, 14, 16 and 20. These areas were not targeted for remediation of contaminated soil in the Decommissioning and Reclamation Plan for the following reasons:

Area 13:	Operational and Construction Landfills. These areas were listed as being of potential environmental concern because the Construction Landfill required relocation to the toe of the Operational Landfill and the consolidated landfill area capped with an engineered cover cap.
Area 14:	Fire Training Area. This area was identified as a potential environmental concern in the 1999 Phase 2 Environmental Site Assessment (ESA), which was conducted prior to the development of the risk based site-specific Soil Quality Remediation Objectives (SQRO's). Upon review of the laboratory data gathered during the 1999 Phase 2 ESA it was determined that the laboratory results met the SQRO's and therefore no remediation work was required at this area.
Area 16:	Explosives Storage/Detonator Magazine. This area was listed as being of potential environmental concern due to the presence of hazardous materials (explosives). During demolition the explosives were removed from this area and detonated.
Area: 20:	Surface Above Active Mining Area. These areas were identified as being of potential public safety concern because during the operation of the mine surface subsidence had occurred over certain older underground openings. This is a geotechnical issue, not a contaminated soil issue and is therefore not commented on in this report. Post closure monitoring at the site will include inspection of this area to confirm stability.

As the aforementioned four areas did not require environmental remediation, no Contaminated Soil Remediation Close Out Reports have been prepared.

I trust that this is satisfactory and that you will find the information presented in this report to be complete and thorough. It has been a great pleasure to have had continued involvement in the Polaris Mine Decommissioning and Reclamation project following the development of the plan in 2001 and I look forward to providing on-going support through the post closure monitoring stage.

Yours very truly,
GARTNER LEE LIMITED



Stephen R. Morison, M.Sc., P.Geol. (NU)
Manager Western Canada Business Unit, Project Principal

AL:gc

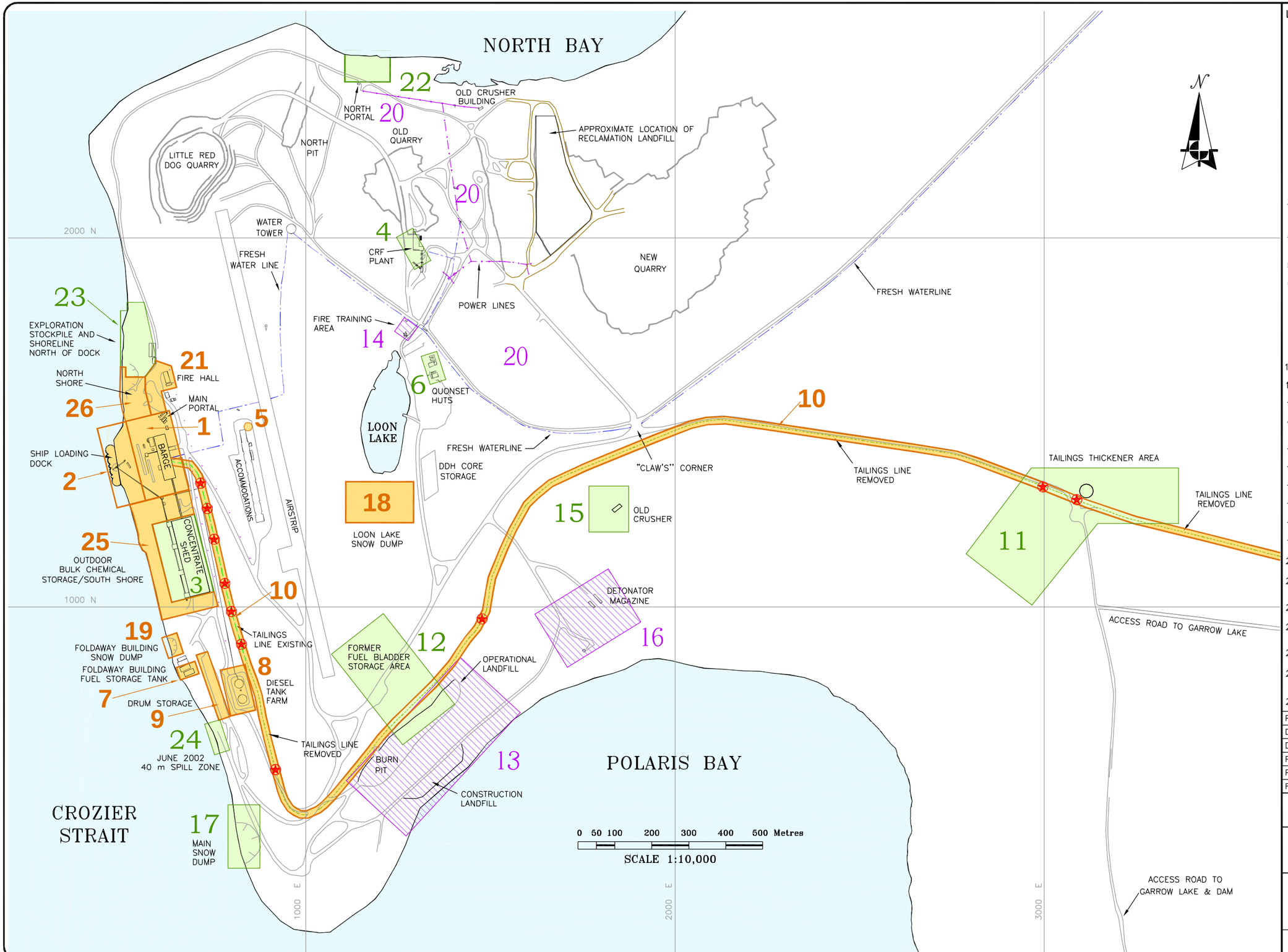
Figures

Figure 1: Contaminated Soils Remediation Progress Plan, December 31, 2003
Figure 2: Contaminated Soils Remediation Progress Plan, December 31, 2004

Enclosures: Polaris Mine Operations Contaminated Soil Remediation Close Out Reports:

Appendix A	Process Barge
Appendix B	Ship Loading Dock
Appendix C	Accommodation Complex
Appendix D	Foldaway Buildings
Appendix E	Tank Farm and Lube Oil Storage
Appendix F	Tailings Pipeline
Appendix G	Loon Lake Snow Dump
Appendix H	Firehall
Appendix I	South Shore
Appendix J	North Shore

CC: E. Denholm, R. Dickin, D. Gregor, A. Kent, A. Laudrum, D. Osmond, T. Pye



LEGEND:

- TAILINGS LINE
- TAILINGS LINE REMOVED
- POWER LINE
- WATER LINE
- ROADS
- TAILINGS LINE BREAKS
- 1 — AREAS NOT MEETING REMEDIAL TARGETS AS OF DECEMBER 31, 2003
- 15 — AREAS MEETING REMEDIAL TARGETS AS OF DECEMBER 31, 2003
- 16 — AREAS NOT CONSIDERED AN ENVIRONMENTAL CONCERN BASED ON 2000 ENVIRONMENTAL SITE ASSESSMENT

1– PROCESS BARGE
2– SHIP LOADING DOCK
3– CONCENTRATE STORAGE SHED AREA
4– CEMENTED ROCK FILL PLANT FUEL STORAGE TANK AREA
5– ACCOMMODATIONS FUEL STORAGE TANK
6– FORMER QUONSET HUTS FUEL STORAGE AREA
7– FOLDAWAY BUILDINGS FUEL STORAGE TANK
8– DIESEL TANK FARM
9– OUTDOOR LUBE/HYDRAULIC OIL AND GLYCOL DRUM STORAGE
10– TAILINGS PIPELINE
11– TAILINGS THICKENER AREA
12– FORMER FUEL BLADDER STORAGE AREA
13– OPERATIONAL AND CONSTRUCTION LANDFILL AND OPEN STORAGE AREA
14– FIRE TRAINING AREA
15– OLD CRUSHER AREA
16– DETONATOR MAGAZINE
17– MAIN SNOW DUMP
18– LOON LAKE SNOW DUMP
19– FOLDAWAY BUILDING SNOW DUMP
20– SURFACE ABOVE FORMER ACTIVE MINING AREA
21– FIREHALL INCLUDING SNOW DUMP, FUEL STORAGE TANK AND ORE STOCKPILE
22– NORTH PORTAL STOCKPILE
23– EXPLORATION STOCKPILE AND SHORELINE NORTH OF DOCK
24– JUNE 2002 – 40 m SPILL ZONE
25– OUTDOOR BULK CHEMICAL STORAGE/SOUTH SHORE
26– NORTH SHORE

REVIEWED BY:	KT/AL
DRAWN BY:	CPW
DATE ISSUED:	13 FEBRUARY, 2004
PROJECT NUMBER:	23-305
FILE NAME:	23305-6F-01.DWG
REVISION:	0

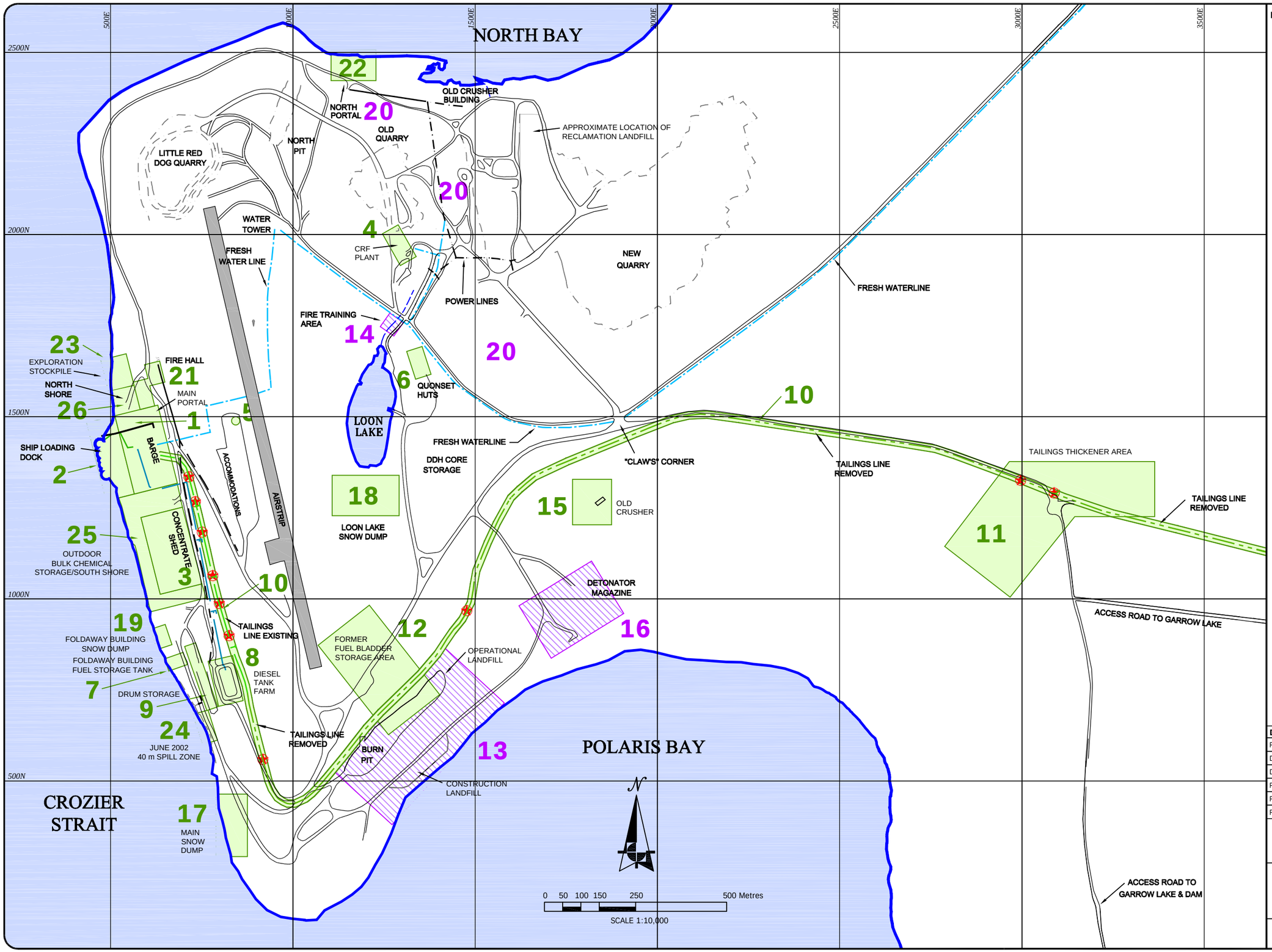
teckcominco

CONTAMINATED SOIL REMEDIATION
2003 CLOSE OUT REPORT
POLARIS MINE, NUNAVUT

CONTAMINATED SOILS REMEDIATION PROGRESS PLAN, DECEMBER 31, 2003

Gartner Lee

Figure No. 1



LEGEND:

- TAILINGS LINE
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- WATER LINE
- ROADS
- TAILINGS LINE BREAKS
- 1 — AREAS NOT MEETING REMEDIAL TARGETS AS OF DECEMBER 31, 2004
- 15 — AREAS MEETING REMEDIAL TARGETS AS OF DECEMBER 31, 2004
- 16 — AREAS NOT CONSIDERED AN ENVIRONMENTAL CONCERN BASED ON 2000 ENVIRONMENTAL SITE ASSESSMENT

1— PROCESS BARGE
2— SHIP LOADING DOCK
3— CONCENTRATE STORAGE SHED
4— CRF PLANT FUEL STORAGE TANK
5— ACCOMMODATIONS FUEL STORAGE TANK
6— QUONSET HUTS FUEL STORAGE TANK
7— FOLDAWAY BUILDINGS FUEL STORAGE TANK
8— DIESEL TANK FARM
9— OUTDOOR LUBE/HYDRAULIC OIL AND GLYCOL DRUM STORAGE
10— TAILINGS PIPELINE
11— TAILINGS THICKENER AREA
12— FORMER FUEL BLADDER STORAGE AREA
13— OPERATIONAL AND CONSTRUCTION LANDFILL AND OPEN STORAGE AREA
14— FIRE TRAINING AREA
15— OLD CRUSHER
16— DETONATOR MAGAZINE
17— MAIN SNOW DUMP
18— LOON LAKE SNOW DUMP
19— FOLDAWAY BUILDING SNOW DUMP
20— SURFACE ABOVE FORMER ACTIVE MINING AREA
21— FIREHALL INCLUDING SNOW DUMP, FUEL STORAGE TANK AND ORE STOCKPILE
22— NORTH PORTAL STOCKPILE
23— EXPLORATION STOCKPILE
24— JUNE 2002 – 40 m SPILL ZONE
25— OUTDOOR BULK CHEMICAL STORAGE/SOUTH SHORE
26— NORTH SHORE

DRAWING INFORMATION:	
REVIEWED BY:	AL
DRAWN BY:	CHARONE
DATE ISSUED:	ISSUED – FEB. 25, 2005
PROJECT NUMBER:	40–137
FILE NAME:	40137–M1–01.DWG
REVISION:	0

POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

CONTAMINATED SOILS REMEDIATION PROGRESS PLAN (DECEMBER 31, 2004)

Gartner Lee

Figure No. 2

Appendices

Polaris Mine Operations Contaminated Soil Remediation Close Out Reports:

- **Appendix A** **Process Barge**
- **Appendix B** **Ship Loading Dock**
- **Appendix C** **Accommodation Complex**
- **Appendix D** **Foldaway Buildings**
- **Appendix E** **Tank Farm and Lube Oil Storage**
- **Appendix F** **Tailings Pipeline**
- **Appendix G** **Loon Lake Snow Dump**
- **Appendix H** **Firehall**
- **Appendix I** **South Shore**
- **Appendix J** **North Shore**

Appendix A

Process Barge

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Process Barge

BACKGROUND

The Process Barge (shown as Area 1 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*) was located between the main portal and the former concentrate storage shed.

The Process Barge (the "Barge") contained the mill and service facilities (the power house, maintenance shops, warehouse, offices and fuel storage in the bottom of the hull). The Barge was constructed in Quebec and towed to the Polaris Mine Site in August 1981. It was 31 m wide, 122 m long and 18 m high above a 4.3 m deep hull. Prior to the arrival of the Barge a berthing lagoon was excavated south of the main portal. In 1982, the Barge was floated into place. A berm was then constructed across the entrance to the lagoon, the sea water was pumped out and the excavation backfilled.

Infrastructure directly associated with the Barge included a utility corridor that connected it with the Accommodation Complex 200 m to the east. The utilidor was a wooden above ground structure that housed freshwater, sewage, electrical and fuel lines. A CAT generator building and trailers were located 25 m west of the Barge. The Steam Bay and a diesel dispensing tank were located at the northwest corner of the Barge. The diesel tank was 15 m north of the CAT generator building. A sewage holding tank was located at the northeast corner of the Barge and a waste oil collection tank was outside the maintenance bay on the north side of the Barge. The concentrate conveyor way was at the south. On the east side was a second conveyor way that fed ore to the mill from the underground workings through the CV03 portal. The tailings line and reclaim water line were also located on the east side of the Barge.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified petroleum hydrocarbon and Lead and Zinc contamination in the soil surrounding the Barge. Four (4) surface samples were collected, nineteen (19) test pits excavated and four (4) boreholes drilled

during the ESA in the Barge remediation area. The sample results indicated that hydrocarbon contamination was present to a depth of 3.1 m and that lead and zinc contamination was present on surface to a depth of 0.61 m. The soil sample results from the ESA and the original topography of the area prior to site remediation are shown on Figure Barge-01-1: *Barge Conditions Before Remediation*.

METHODOLOGY

Delineation

The preliminary area to be remediated, as identified in the ESA as an "Area of Concern", was further delineated for excavation through the collection and analysis of field screening samples from nineteen (19) boreholes drilled in 2003 and eight (8) boreholes drilled in 2004. The boreholes were advanced with an air rotary quarry drill. The borehole depths ranged from 3 m to 6.7 m. A total of one hundred ninety (190) composite samples were collected from the drill returns that accumulated at the mouth of the boreholes. The composite samples were collected over 0.6 m to 0.8 m intervals. Following the collection of each sample the surface surrounding the borehole was cleared of the drill cuttings, before advancing the hole the next 0.6 m to 0.8 m sample interval.

The visual appearance and odour of the soil, along with field screening measurements obtained from the borehole samples were used to delineate the area to be excavated. The hydrocarbon field screening measurements were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. The samples were field screened for metals using the Niton X-ray fluorescence (XRF) elemental analyser.

The results from the drilling indicated hydrocarbon contamination to a depth of 4.5 m and metal contamination to a depth of 5.5 m.

Excavation

Excavation of the Barge area commenced August 26, 2003, after the structure was dismantled and the hull of the Barge removed. Excavation in 2003 continued until November 3, 2003. The excavation of the Barge area re-commenced again April 21, 2004 and it was completed July 16, 2004.

During 2003, the contaminated soil under the footprint of the former Barge hull was excavated. Beneath the eastern half of the footprint of the former barge the excavation extended to solid bedrock. Soil within the excavation area was ripped and loaded into trucks with an excavator. A smooth lipped bucket on the excavator was used to clean the residual contaminated soils at the base of the excavation. To direct the excavation activities, samples were collected across the

floor and walls of the excavation and field screened using the PID for hydrocarbons and the XRF analyzer for Lead and Zinc. Upon receipt of field screening results that indicated the Soil Quality Remediation Objectives (SQRO's) were met confirmation samples were collected, the excavation the limits were surveyed and the remediated area was backfilled.

That portion of the Barge excavated in 2003 was backfilled prior to the end of the 2003 work with between 4 m and 7 m of fill. The areas were backfilled in order to prevent spring runoff water in 2004 from flowing across the remaining contaminated soils and then into this area and re-contaminating it. At the north end of the area excavated in 2003 hydrocarbon contamination remained present in the walls. As an additional mitigation measure to inhibit hydrocarbon contaminated spring runoff from re-contaminating the remediated area the walls and adjacent floor of the excavation from the utility corridor north, along the northern face and then south to below the CAT generator building were sprayed with water when the air temperature was below –20°C and a barrier of ice established prior to backfilling.

A 50 m by 50 m area at the south end of the Barge was excavated in October 2003 and it was backfilled prior to the receipt of the analytical laboratory results due to the onset of winter conditions. The analytical laboratory results from the floor of the south end of the 2003 excavation did not meet the SQRO's and the backfilled material was re-excavated and the floor of the excavation dug deeper and additional remediation confirmation samples were collected.

In the spring of 2004 the contaminated soil remaining to the west of the former Barge footprint was excavated while the surface was frozen. The excavation program was guided by observations made on the walls of the excavation in 2003 along with field screening results from the boreholes drilled in 2003 and 2004. Following the removal of contaminated material the floor and walls of the excavation were sampled to determine where additional excavation was required to meet the SQRO's. The excavator with a ripper attachment was used to expand the excavation further where required. The excavated area was then backfilled with between 3 m and 7 m of fill in order to establish the final shoreline configuration.

The limits of the excavation are shown on Figure Barge-01-2: *Barge Conditions After Remediation*. The material excavated was disposed in the mine workings in accordance with regulatory approvals.

Confirmation Sampling

Upon receipt of field screening results that indicated that the material remaining in the excavation would meet the SQRO's, confirmation samples were collected in accordance with Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols The excavated area was subdivided into individual composite sampling areas approximately 25 m by 25 m required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation. Composite samples were created by collecting four or five

evenly spaced aliquots of soil with in the individual composite sample area. A single aliquot of soil from a specific point is a discrete sample and these samples were collected randomly.

The soil samples were collected at the excavation limits and submitted to ALS Environmental (ALS) for analysis of Extractable Petroleum Hydrocarbons (EPH), metals and Polycyclic Aromatic Hydrocarbons (PAH). Additional excavation was undertaken in areas where the laboratory analytical results did not meet the SQRO's and additional confirmatory samples were taken upon completion of the excavation.

ANALYTICAL RESULTS

Analytical laboratory results for EPH, metals and PAH are summarized in Tables: BA-01-1, BA-01-2, and BA-01-3 along with the approved Polaris Mine SQRO's for petroleum hydrocarbons and metals. Eighty two (82) hydrocarbon and eighty two (82) metal remediation confirmation samples were submitted from the former Barge area. The hydrocarbon samples were analyzed as follows: fifty (50) floor composite samples, ten (10) wall composite samples, seventeen (17) discrete samples and five (5) quality assurance quality control (QA/QC) samples. All hydrocarbon confirmatory samples were analyzed for EPH, and fourteen (14) of these samples were also analyzed for PAH. The metal samples were analyzed for Lead and Zinc as follows: fifty one (51) floor composite samples, fifteen (15) wall composite samples, ten (10) discrete samples and six (6) quality assurance quality control (QA/QC) samples. Thirteen (13) randomly selected samples were analyzed for total metals. The soils quality results and the lateral limits of the excavation are shown on Figure Barge-01-2.

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with the collection and analysis of soil included: the comparison of on-site field screening samples, the submission of blind duplicates to the analytical laboratory, and the analysis of analytical laboratory replicates. Relative percent differences (RpDs) for hydrocarbon concentrations of EPH C_{10}-C_{19} and EPH C_{19}-C_{32} have been calculated and compiled in Table: BA-01-4 for six (6) analytical laboratory duplicates and nine (9) analytical laboratory replicates. RpDs for concentrations of Lead and Zinc have been calculated and compiled in Table: BA-01-5 for six (6) field screening duplicates, six (6) laboratory duplicates and five (5) laboratory replicates. In total thirty two (32) QA/QC sample sets have been evaluated, including eleven (11) remediation confirmation sample sets.

Thirty (30) of the sample results and their duplicate/replicate results either returned results below the practical quantitation limit, in which case the RpD value has been identified as "na" (not applicable) or they returned acceptable RpDs below the site specific objective of 50%. Two analytical laboratory duplicates returned results greater than the objective and therefore require further explanation.

The variance between the EPH C_{10}-C_{19} results for sample Barge-362-F-C (3290 mg/kg) and its blind duplicate, Barge-364-F-Q (1930 mg/kg) is considered representative of the heterogeneity of an area prior to achieving the remediation objectives (further excavation was undertaken in this area in order to meet the remediation objective of 1000 mg.kg EPH C_{10}-C_{19}). The variance between Zinc concentrations in sample Barge-11919-F-D (217 mg/kg) and its blind duplicate, Barge-11986-F-Q (472 mg/kg) is considered indicative the heterogeneity present in samples with relatively low concentrations of Zinc at the Polaris Mine Site.

Polaris Mine Soil Quality Remediation Objectives

Seventy five (75) of the eighty two (82) hydrocarbon remediation confirmation samples (91%) returned results below the Polaris Mines SQRO's for EPH. Five floor composite samples, one discrete sample and one QA/QC sample returned EPH C_{10}-C_{19} concentrations greater than the SQRO. Four of the samples were collected from the south end of the former process barge footprint in 2003 (Barge-301-F-C, Barge-360-F-C, and Barge-369-F-C and it's duplicate Barge-370-F-Q) and most of this area was re-excavated in 2004. Samples Barge-11933-F-C and Barge-11935-F-C (which met the SQRO's for EPH C_{10}-C_{19}) were collected from the base of the area re-excavated in 2004, as shown on Figure: Barge-02-1. In addition, QA/QC sample Barge-363-F-Q is a duplicate of sample Barge-360-F-C and the EPH concentrations in this sample met the SQROs.

Seventy nine (79) of the eighty two (82) metals remediation confirmation samples (96%) returned results that met the Polaris Mine SQRO's for Lead and Zinc. Two of the three samples that returned results greater than the SQROs, including Lead concentrations greater than two times the SQRO, were collected from the south end of the former process barge footprint in 2003 (Barge-360-F-C and Barge-361-F-C). Most of the area covered by these two samples was re-excavated in 2004. Sample Barge-11935-F-C, which met the SQRO's for Lead (2000 mg/kg) and Zinc (10000 mg/kg) was collected from the base of the area re-excavated in 2004. The duplicate QA/QC sample Barge-363-F-Q of Barge-360-F-C returned Lead and Zinc concentrations that sample met the SQROs. Lead concentrations in sample Barge-10492-F-C (2500 mg/kg), collected beneath the former diesel dispensing tank exceeded the SQRO.

The approved site-specific remedial objectives allow for minor exceedances in a small percentage of the confirmatory sample area, as long as the concentration is less than twice the remedial target. Since only a small percentage of the remedial area exceeds the SQROs for EPH, Lead and Zinc and given that the area with Lead concentrations greater than two times the remedial target was mostly re-excavated and that a duplicate sample from the area met the objectives the former Barge area is therefore considered to be in accordance with the site specific remedial objectives.

Discrete samples were collected to discern the homogeneity of the sample area represented by the composite samples. The tables below show a variability in the metal and hydrocarbon concentrations of the discrete samples versus the composite areas they represented as the composite samples represent the area as a whole and the discrete samples indicate the homogeneity of the given sample areas.

Summary of Discrete Hydrocarbon Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	EPH_{10-19} (mg/kg)	EPH_{19-32} (mg/kg)	Discrete Sample ID	EPH_{10-19} (mg/kg)	EPH_{19-32} (mg/kg)
Barge-175-F-C	<200	<200	Barge-169-F-D	<200	<200
Barge-260-F-C	<200	<200	Barge-182-F-D	724	<200
Barge-220-F-C	208	<200	Barge-194-F-D	<200	<200
Barge-220-F-C	208	<200	Barge-195-F-D	686	<200
Barge-221-F-C	230	<200	Barge-199-F-D	554	<200
Barge-224-F-C	**1340**	<200	Barge-207-F-D	259	<200
Barge-224-F-C	**1340**	<200	Barge-209-F-D	**2380**	<200
Barge-222-F-C	436	<200	Barge-211-F-D	206	<200
Barge-11931-F-C	280	480	Barge-251-F-D	<200	<200
Barge-11931-F-C	280	480	Barge-252-W-D	<200	<200
Barge-261-F-C	<200	<200	Barge258-F-D	<200	<200
Barge-360-F-C	**1160**	230	Barge-345-F-D	330	<200
Barge-10683-F-C	860	270	Barge-347-F-D	450	<200
Barge-11935-F-C	<200	240	Barge-355-F-D	780	230
Barge-11933-F-C	<200	380	Barge-357-F-D	320	<200
Barge-10580-F-C	<200	<200	Barge-10525-F-D	<200	<200
Barge-10648-W-C	<200	268	Shore-11985-F-D	<200	<200

Summary of Discrete Metals Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	Lead (mg/kg)	Zinc (mg/kg)	Discrete Sample ID	Lead (mg/kg)	Zinc (mg/kg)
Barge-175-F-C	<100	9	Barge-169-F-D	<100	5
Barge-11931-F-C	<100	55	Barge-174-W-D	<200	5
Barge-224-F-C	<200	2040	Barge-207-F-D	<200	996
Barge-222-F-C	<200	1280	Barge-211-F-D	<200	766
Barge-360-F-C	**5350**	**10200**	Barge-345-F-D	1440	7050
Barge-10684-F-C	970	6930	Barge-347-F-D	720	4660
Barge-10580-F-C	1000	2210	Barge-10525-F-D	370	1480
Barge-11935-F-C	180	653	Barge-11913-F-D	1570	2330
Barge-11933-F-C	120	427	Barge-11919-F-D	<100	217
Barge-11957-F-C	170	469	Shore-12071-W-D	295	473

Generic Federal Soil Quality Guidelines for Parkland Land Use

The concentrations of Barium ranged from 280 mg/kg to 896 mg/kg in the ten remediation confirmation samples analysed for total metals. The generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guideline (CEQG) for Parkland land use for Barium in soil is 500 mg/kg. Three of the samples exceeded this generic objective (Barge 10822-F-C, Barge-11919-F-D and Barge-11935-F-C). The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

Barium is a common mineral associated with lead sulphides, and it is found in cavities in limestone and dolostone. Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results*, are considered to be representative of background conditions. Samples were collected at the following intervals: surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of Barium greater than generic CCME CEQG for Parkland land use were detected in each interval. The variability of Barium concentrations in those samples in listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The immobile nature of the Barium encountered on site was demonstrated in the ESA leachate test results that returned Barium concentrations at levels less than the detection limit of <3 mg/L and Barium was therefore not identified as a contaminant of concern in the ESA.

The concentrations of Cadmium ranged from <1 mg/kg to 18.1 mg/kg in the remediation confirmation samples from the Barge area analysed for total metals. Cadmium results for three of the samples (Barge-263-F-C, Barge-10770-W-C and Barge-10823-F-C) exceeded the CCME CEQG for Parkland land use of 10 mg/kg Cadmium in soil. Cadmium was not identified as a contaminant of concern based on the total metal analyses and leachate test results conducted during the ESA. Given the immobile nature of the Cadmium encountered on site, as demonstrated by the leachate results and the level of concentrations being less than twice the generic CCME CEQG for Parkland land use, no further remedial excavation work is considered necessary.

Two floor composite samples, exceeded the CCME CEQG for Parkland land use of 0.6 mg/kg Naphthalene in soil. The Naphthalene concentration in samples Barge-223-F-C and Barge-301-F-C were 0.84 mg/kg and 1.03 mg/kg respectively. The EPH results for Barge-301-F-C also failed to meet the SQROs and the area was re-excavated in 2004. Results for sample Barge-11935-F-C (which met the SQRO's for EPH C_{10}-C_{19}) were collected from the base of the area re-excavated in 2004, as shown on Figure: Barge-02-1. The area represented by sample Barge-223-F-C has been since covered by between 6 m and 7 m of fill and it is more than 75 m to the existing final shoreline, it is therefore isolated from the marine and terrestrial environment.

CONCLUSION

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the former Barge area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

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ATTACHMENTS

Tables

Table BA-02-1:	Barge Area Remediation Confirmation Soil Samples – Hydrocarbons
Table BA-02-2:	Barge Area Remediation Confirmation Soil Samples – Metals
Table BA-02-3:	Barge Area Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table BA-02-4:	Barge Area Quality Assurance and Quality Control Remediation Soil Samples - Metals
Table BA-02-5:	Barge Area Quality Assurance and Quality Control Remediation Soil Samples – Hydrocarbons

Figures

Figure Barge-01-1:	Barge Conditions Before Remediation
Figure Barge-01-2:	Barge Conditions After Remediation

Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge						
		Sample ID	Barge-169-F-D	Barge-175-F-C	Barge-176-F-C	Barge-182-F-D	Barge-194-F-D	Barge-195-F-D	Barge-199-F-D
		Date Sampled	09-Oct-03	09-Oct-03	09-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03
		ALS File Number	T5345	T5345	T5345	T5351	T5351	T5351	T5351
		Field Screen (ppm)[b]	75	-	-	185	100	175	105
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	240	724	<200	686	554
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	<200	<200	-	-	-	-	-
HEPH[c]	1000	mg/kg	<200	<200	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge							
		Sample ID	Barge-207-F-D	Barge-209-F-D	Barge-211-F-D	Barge-218-F-C	Barge-219-F-C	Barge-220-F-C	Barge-221-F-C	Barge-222-F-C
		Date Sampled	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03
		ALS File Number	T5351	T5351	T5351	T5351	T5351	T5351	T5351	T5351
		Field Screen (ppm)[b]	120	1600	85	-	-	-	85	85
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	259	**2380**	206	210	<200	208	230	436
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	210	<200	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	<200	<200	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge							
		Sample ID	Barge-223-F-C	Barge-225-F-Q	Barge-224-F-C	Barge-251-F-D	Barge-252-W-D	Barge-258-F-D	Barge-260-F-C	Barge-261-F-C
		Date Sampled	11-Oct-03	11-Oct-03	11-Oct-03	18-Oct-03	18-Oct-03	18-Oct-03	18-Oct-03	18-Oct-03
		ALS File Number	T5351	duplicate of	T5351	T5735	T5735	T5735	T5735	T5735
		Field Screen (ppm)[b]	155	Barge-223-F-C	145	80	60	85	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	463	406	**1340**	<200	<200	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	462	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	<200	-	-	-	-	-	-	-

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge							
		Sample ID	Barge-263-W-C	Barge-265-F-C	Barge-300-F-C	Barge-301-F-C	Barge-302-F-C	Barge-305-F-C	Barge-312-W-C	Barge-345-F-D
		Date Sampled	19-Oct-06	19-Oct-03	21-Oct-03	21-Oct-03	21-Oct-03	21-Oct-03	24-Oct-03	28-Oct-03
		ALS File Number	T5735	T5735	T5735	T5735	T5735	T5735	T5790	T6195
		Field Screen (ppm)[b]	-	-	30	125	30	25	60	195
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	590	<200	<200	**1030**	<200	<200	<200	330
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	210	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	**1030**	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	210	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge						
		Sample ID	Barge-347-F-D	Barge-363-F-Q	Barge-355-F-D	Barge-357-F-D	Barge-360-F-C	Barge-361-F-C	Barge-369-F-C
		Date Sampled	28-Oct-03	28-Oct-03	28-Oct-03	28-Oct-03	28-Oct-03	28-Oct-03	31-Oct-03
		ALS File Number	T6195	duplicate of	T6195	T6195	T6195	T6195	T6190
		Field Screen (ppm)[b]	180	Barge-347-F-D	95	325	-	30	175
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	450	840	780	320	**1160**	970	**1030**
EPH C_{19}-C_{32}	1000	mg/kg	<200	210	230	<200	230	210	250
LEPH[c]	1000	mg/kg	-	-	-	320	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	<200	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

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a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge						
		Sample ID	Barge-370-F-Q	Barge-10492-F-C	Barge-10493-F-C	Barge-10525-F-D	Barge-10580-F-C	Barge-10581-F-C	Barge-10599-F-C
		Date Sampled	31-Oct-03	06-May-04	06-May-04	10-May-04	10-May-04	10-May-04	10-May-04
		ALS File Number	duplicate of	U3342	U3342	U3476r	U3476r	U3476r	U3476r
		Field Screen (ppm)[b]	Barge-369-F-C	-	55	45	-	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	**1200**	660	<200	<200	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	260	210	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	-	<200
HEPH[c]	1000	mg/kg	-	-	-	-	-	-	<200

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b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge					
		Sample ID	Barge-10648-W-C	Barge-10649-F-C	Barge-10650-F-C	Barge-10659-F-C	Barge-10683-F-C	Barge-10729-F-C
		Date Sampled	13-May-04	13-May-04	13-May-04	18-May-04	18-May-04	21-May-04
		ALS File Number	U3564rr	U3564rr	U3564rr	U3761	U3761	U3898r
		Field Screen (ppm)[b]	30	-	-	-	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	200	<200	860	<200
EPH C_{19}-C_{32}	1000	mg/kg	260	320	380	<200	270	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge					
		Sample ID	Barge-10730-W-C	Barge-10734-W-Q	Barge-10731-F-C	Barge-10733-F-C	Barge-10746-F-C	Barge-10770-W-C
		Date Sampled	21-May-04	21-May-04	21-May-04	20-May-04	20-May-04	24-May-04
		ALS File Number	U3898r	duplicate of	U3898r	U3898r	U3898r	U3969r
		Field Screen (ppm)[b]	10	Barge-10730-W-C	-	-	-	30
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	210	<200	<200	<200	**1520**	270
EPH C_{19}-C_{32}	1000	mg/kg	470	370	220	<200	480	260
LEPH[c]	1000	mg/kg	-	-	-	-	-	270
HEPH[c]	1000	mg/kg	-	-	-	-	-	260

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge						
		Sample ID	Barge-10822-F-C	Barge-10823-F-C	Barge-10824-F-C	Barge-10825-F-C	Barge-11177-F-C	Barge-11207-W-C	Barge-11310-F-C
		Date Sampled	24-May-04	24-May-04	24-May-04	24-May-04	05-Jun-04	02-Jun-04	31-May-04
		ALS File Number	U3969r	U3969r	U3969r	U3969r	U4269r	U4269r	U4137
		Field Screen (ppm)[b]	-	-	-	-	55	45	-
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	450	<200	200	<200	900	210
EPH C_{19}-C_{32}	1000	mg/kg	210	<200	<200	<200	<200	350	270
LEPH[c]	1000	mg/kg	<200	450	-	-	-	-	-
HEPH[c]	1000	mg/kg	210	<200	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge					
		Sample ID	Barge-11311-F-C	Barge-11325-W-C	Barge-11547-W-C	Barge-11548-W-C	Barge-11549-W-C	Barge-11550-F-C
		Date Sampled	31-May-04	08-Jun-04	17-Jun-04	17-Jun-04	17-Jun-04	17-Jun-04
		ALS File Number	U4137	U4378	U4781	U4781	U4781	U4781
		Field Screen (ppm)[b]	-	-	30	30	40	30
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	230	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-

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a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge				
		Sample ID	Barge-11927-F-C	Barge-11928-F-C	Barge-11929-F-C	Barge-11930-F-C	Barge-11931-F-C
		Date Sampled	07-Jul-04	07-Jul-04	07-Jul-04	07-Jul-04	07-Jul-04
		ALS File Number	U5597r	U5597r	U5597r	U5597r	U5597r
		Field Screen (ppm)[b]	-	-	-	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**				
Extractable Hydrocarbons							
EPH C_{10}-C_{19}	1000	mg/kg	340	<200	230	250	280
EPH C_{19}-C_{32}	1000	mg/kg	520	380	380	440	480
LEPH[c]	1000	mg/kg	-	-	-	-	280
HEPH[c]	1000	mg/kg	-	-	-	-	480

Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site

tical method detection limit.
nducted, or no guideline.

Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Regulation for Parkland (PL) Land Use.
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Table BA-01-1. Barge Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge					
		Sample ID	Barge-11933-F-C	Barge-11934-F-Q	Barge-11935-F-C	Shore-11985-F-D	Barge-12179-F-C	Barge-12180-F-C
		Date Sampled	05-Jul-04	05-Jul-04	05-Jul-04	12-Jul-04	27-Aug-04	27-Aug-04
		ALS File Number	U5597r	duplicate of	U5597r	U5836	U7584(1)	U7584(1)
		Field Screen (ppm)[b]	-	Barge-11933-F-C	-	-	10	10
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	380	390	240	<200	230	220
LEPH[c]	1000	mg/kg	-	-	<200	<200	-	-
HEPH[c]	1000	mg/kg	-	-	240	<200	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge							
				Sample ID	Barge-169-F-D	Barge-174-W-D	Barge-175-F-C	Barge-176-F-C	Barge-207-F-D	Barge-211-F-D	Barge-219-F-C	Barge-222-F-C
				Date Sampled	09-Oct-03	11-Oct-03	09-Oct-03	09-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03
				ALS File Number	T5345	T5351	T5345	T5345	T5351	T5351	T5351	T5351
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	29	12	-	-	79	113	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	111	87	-	-	838	703	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH		-	-	-	-	9.2	-	-	-	-	-	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	<30	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	<20	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	10	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	<2	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	<2	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	<6	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	<6	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	<3	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<100	<200	<100	<100	<200	<200	<200	<200
Mercury	T-Hg	-	7	mg/kg	-	<0.05	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<20	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	<20	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	<4	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	<6	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	<20	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	<6	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	5	5	9	10	996	766	2630	1280

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Barge							
				Sample ID	Barge-223-F-C	Barge-225-F-Q	Barge-224-F-C	Barge-260-F-C	Barge-261-F-C	Barge-263-W-C	Barge-265-F-C	Barge-300-F-C
				Date Sampled	11-Oct-03	11-Oct-03	11-Oct-03	18-Oct-03	18-Oct-03	19-Oct-03	19-Oct-03	21-Oct-03
				ALS File Number	T5351	T5351	T5351	T5735	T5735	T5735	T5735	T5735
				Field Screen Pb (ppm)[b]	-	duplicate of	-	-	-	-	-	150
				Field Screen Zn (ppm)[b]	-	-	-	-	-	-	-	646
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH		-	-	-	8.59	-	-	-	-	8.4	-	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	<30	-	-	-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	<20	-	-	-	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	467	-	-	-	-	277	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<2	-	-	-	-	<1.0	-	-
Cadmium	T-Cd	-	10	mg/kg	<2	-	-	-	-	**18.1**	-	-
Chromium	T-Cr	-	64	mg/kg	<6	-	-	-	-	6.7	-	-
Cobalt	T-Co	-	50[d]	mg/kg	<6	-	-	-	-	<4.0	-	-
Copper	T-Cu	-	63	mg/kg	<3	-	-	-	-	8.9	-	-
Lead	T-Pb	2000	-	mg/kg	237	456	<200	<100	<100	1790	1030	120
Mercury	T-Hg	-	7	mg/kg	0.11	-	-	-	-	<0.050	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<20	-	-	-	-	<8.0	-	-
Nickel	T-Ni	-	50	mg/kg	<20	-	-	-	-	<10	-	-
Selenium	T-Se	-	1	mg/kg	<4	-	-	-	-	<2.0	-	-
Silver	T-Ag	-	20[d]	mg/kg	<6	-	-	-	-	<4.0	-	-
Tin	T-Sn	-	50[d]	mg/kg	<20	-	-	-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	8	-	-	-	-	11.4	-	-
Zinc	T-Zn	10000	-	mg/kg	506	420	2040	178	11.6	6670	8910	475

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge						
				Sample ID	Barge-301-F-C	Barge-302-F-C	Barge-305-F-C	Barge-307-W-C	Barge-312-W-C	Barge-345-F-D	Barge-347-F-D
				Date Sampled	21-Oct-03	21-Oct-03	21-Oct-03	24-Oct-03	24-Oct-03	28-Oct-03	28-Oct-03
				ALS File Number	T5735	T5735	T5735	T5790	T5790	T6195	T6195
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	1594	45	376	793	1752	706	534
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	5945	351	2784	2536	6386	3851	2627
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	8.89
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	<20
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	<10
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	311
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	<1.0
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	9.9
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	<4.0
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	<4.0
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	2.8
Lead	T-Pb	2000	-	mg/kg	830	<100	420	1280	1240	1440	720
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	<0.050
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	<8.0
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	<10
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	<2.0
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	<4.0
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	<10
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	6.4
Zinc	T-Zn	10000	-	mg/kg	3000	294	2150	2240	2720	7050	4660

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge						
				Sample ID	Barge-360-F-C	Barge-363-F-Q	Barge-361-F-C	Barge-369-F-C	Barge-370-F-Q	Barge-10492-F-C	Barge-10493-F-C
				Date Sampled	28-Oct-03	28-Oct-03	28-Oct-03	31-Oct-03	31-Oct-03	06-May-04	06-May-04
				ALS File Number	T6195	T6195	T6195	T6190	T6190	U3342	U3342
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	duplicate of	-	-	duplicate of	1109	246
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	Barge-360-F-C	-	-	Barge-369-F-C	22790	349
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	**5350**	440	**5570**	520	800	**2500**	870
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	**10200**	2990	3830	2470	2890	4360	2450

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge						
				Sample ID	Barge-10525-F-D	Barge-10580-F-C	Barge-10581-F-C	Barge-10649-F-C	Barge-10650-F-C	Barge-10684-F-C	Barge-10729-F-C
				Date Sampled	10-May-04	10-May-04	10-May-04	13-May-04	13-May-04	18-May-04	21-May-04
				ALS File Number	U3476r	U3476r	U3476r	U3564rr	U3564rr	U3761	U3898r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	195	-	-	-	-	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	887	-	-	-	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	370	1000	870	260	260	970	160
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	1480	2210	1720	637	2490	6930	500

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge						
				Sample ID	Barge-10732-F-C	Barge-10733-F-C	Barge-10746-F-C	Barge-10770-W-C	Barge-10822-F-C	Barge-10823-F-C	Barge-10824-F-C
				Date Sampled	21-May-04	21-May-04	20-May-04	24-May-04	24-May-04	24-May-04	24-May-04
				ALS File Number	U3898r	U3898r	U3898r	U3969r	U3969r	U3969r	U3969r
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	-	-	-	463	-	-	-
				Field Screen Zn (ppm)[b]	-	-	-	1528	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	8.44	8.68	8.67	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<20	<20	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	-	<10	<10	<10	-
Barium	T-Ba	-	500	mg/kg	-	-	-	403	**762**	368	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1.0	<1.0	<1.0	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	**15.9**	<1.0	**12.6**	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	5.5	8.8	9.8	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	<4.0	<4.0	<4.0	-
Copper	T-Cu	-	63	mg/kg	-	-	-	6.5	12.1	6.9	-
Lead	T-Pb	2000	-	mg/kg	<200	<200	<100	1600	<100	1100	1980
Mercury	T-Hg	-	7	mg/kg	-	-	-	<0.050	0.056	<0.050	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8.0	<8.0	<8.0	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	<10	18	13	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<4.0	<4.0	<4.0	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4.0	<4.0	<4.0	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<10	<10	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	-	31.8	48.8	31	-
Zinc	T-Zn	10000	-	mg/kg	173	220	200	6570	233	5870	9790

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

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"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge						
				Sample ID	Barge-10825-F-C	Barge-11177-F-C	Barge-11207-W-C	Barge-11310-F-C	Barge-11311-F-C	Barge-11547-W-C	Barge-11548-W-C
				Date Sampled	24-May-04	05-Jun-04	02-Jun-04	31-May-04	31-May-04	17-Jun-04	17-Jun-04
				ALS File Number	U3969r	U4269r	U4269r	U4137	U4137	U4781	U4781
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	357	1389	-	-	145	100
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	4952	5110	-	-	577	351
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	640	740	1860	550	1660	110	150
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	3860	6510	17.3	8500	6590	314	374

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge						
				Sample ID	Barge-11549-W-C	Barge-11550-F-C	Barge-11653-W-C	Barge-11654-W-C	Barge-11655-F-C	Barge-11656-F-C	Barge-11819-F-C
				Date Sampled	17-Jun-04	17-Jun-04	24-Jun-04	24-Jun-04	24-Jun-04	24-Jun-04	30-Jun-04
				ALS File Number	U4781	U4781	U5050	U5050	U5050	U5050	U5353r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	109	202	384	330	381	331	420
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	464	614	1521	1494	1194	1086	1884
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	120	190	420	330	380	370	275
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	329	501	1040	734	862	762	808

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Parameter		Polaris Mine Soil Quality Remediation Objectives[a] Site Specific	Polaris Mine Soil Quality Remediation Objectives[a] CEQG (PL)[c]	Units	Location: Barge	Barge	Barge	Barge	Barge	Barge	Barge
Sample ID					Barge-11820-F-C	Barge-11846-W-C	Barge-11874-F-C	Barge-11878-W-C	Barge-11913-F-D	Barge-11919-F-D	Barge-11986-F-Q
Date Sampled					30-Jun-04	02-Jul-04	02-Jul-04	04-Jul-04	07-Jul-04	07-Jul-04	07-Jul-04
ALS File Number					U5353r	U5597r	U5597r	U5597r	U5836	U5836	U5836
Field Screen Pb (ppm)[b]					388	366	98	122	126	309	duplicate of
Field Screen Zn (ppm)[b]					1534	1060	268	218	378	1114	Barge-11919-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	8.32	8.25	8.37
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	<20	<20	<20
Arsenic	T-As	-	12	mg/kg	-	-	-	-	<10	11	<10
Barium	T-Ba	-	500	mg/kg	-	-	-	-	471	**896**	374
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	<1.0	<1.0	<1.0
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	5	<1.0	1.8
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	5.4	13.3	5.2
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	<4.0	6.7	<4.0
Copper	T-Cu	-	63	mg/kg	-	-	-	-	12.2	29	11.1
Lead	T-Pb	2000	-	mg/kg	263	390	<100	<100	1570	<100	120
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	<0.050	0.114	<0.050
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	<8.0	<8.0	<8.0
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	<10	40	<10
Selenium	T-Se	-	1	mg/kg	-	-	-	-	<4.0	<4.0	<4.0
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	<4.0	<4.0	<4.0
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	<10	<10	<10
Vanadium	T-V	-	130	mg/kg	-	-	-	-	31.8	87.2	31.6
Zinc	T-Zn	10000	-	mg/kg	876	1170	103	117	2330	217	472

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Barge						
				Sample ID	Barge-11927-F-C	Barge-11928-F-C	Barge-11929-F-C	Barge-11930-F-C	Barge-11931-F-C	Barge-11933-F-C	Barge-11934-F-Q
				Date Sampled	07-Jul-04	07-Jul-04	07-Jul-04	07-Jul-04	07-Jul-04	05-Jul-04	05-Jul-04
				ALS File Number	U5597r	U5597r	U5597r	U5597r	U5597r	U5597r	U5597r
				Field Screen Pb (ppm)[b]	86	68	91	128	73	-	duplicate of
				Field Screen Zn (ppm)[b]	139	98	99	249	173	-	Barge-11933-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	8.58	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	490	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	<1.0	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	<1.0	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	10.8	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	8.6	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	31.1	-	-
Lead	T-Pb	2000	-	mg/kg	<100	<100	<100	<100	<100	120	120
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	0.171	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	<8.0	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	43	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	<6.0	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	<4.0	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	83	-	-
Zinc	T-Zn	10000	-	mg/kg	43.3	36.1	32	55.8	55.4	427	587

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Parameter		Polaris Mine Soil Quality Remediation Objectives[a] Site Specific	CEQG (PL)[c]	Units	Location: Barge						
					Sample ID: Barge-11935-F-C	Barge-11957-F-C	Barge-11972-W-C	Barge-11973-F-C	Barge-11974-W-C	Barge-11975-W-C	Barge-11976-F-C
					Date Sampled: 05-Jul-04	09-Jul-04	09-Jul-04	09-Jul-04	09-Jul-04	09-Jul-04	09-Jul-04
					ALS File Number: U5597r	U5615r	U5615r	U5615r	U5615r	U5615r	U5615r
					Field Screen Pb (ppm)[b]: -	206	187	219	242	367	319
					Field Screen Zn (ppm)[b]: -	454	582	630	2674	2737	2336
					Analytical Results						
pH		-	-	-	8.26	-	-	-	-	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	<20	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	<10	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	**677**	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<1.0	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	1.8	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	8.5	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	<4.0	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	14.8	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	180	170	130	210	370	710	310
Mercury	T-Hg	-	7	mg/kg	0.066	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<8.0	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	21	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	<4.0	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	<4.0	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	<10	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	56.2	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	653	469	376	636	3390	4030	4900

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-2. Barge Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Barge		
				Sample ID	Barge-11977-F-C	Barge-11978-F-Q	Shore-12071-W-D
				Date Sampled	09-Jul-04	09-Jul-04	26-Jul-04
				ALS File Number	U5615r	U5615r	U6530rr
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	277	duplicate of	540
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	2663	Barge-11977-F-C	1074
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**		
pH		-	-	-	8.65	-	-
Metals							
Antimony	T-Sb	-	20[d]	mg/kg	<40	-	-
Arsenic	T-As	-	12	mg/kg	<200	-	-
Barium	T-Ba	-	500	mg/kg	280	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	7	-	-
Chromium	T-Cr	-	64	mg/kg	<4	-	-
Cobalt	T-Co	-	50[d]	mg/kg	<4	-	-
Copper	T-Cu	-	63	mg/kg	4	-	-
Lead	T-Pb	2000	-	mg/kg	590	380	295
Mercury	T-Hg	-	7	mg/kg	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<8	-	-
Nickel	T-Ni	-	50	mg/kg	<10	-	-
Selenium	T-Se	-	1	mg/kg	<100	-	-
Silver	T-Ag	-	20[d]	mg/kg	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	<20	-	-
Vanadium	T-V	-	130	mg/kg	22	-	-
Zinc	T-Zn	10000	-	mg/kg	3650	4310	473

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-3. Barge Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge					
		ALS Sample ID	Barge-175-F-C	Barge-218-F-C	Barge-219-F-C	Barge-223-F-C	Barge-10599-F-C	Barge-10770-W-C
		Date Sampled	09-Oct-03	11-Oct-03	11-Oct-03	11-Oct-03	10-May-04	24-May-04
		ALS File Number	T5345	T5351	T5351	T5351	U3476r	U3969r
		Field Screen (ppm)[b]				155		30
Parameter	**CEQG[c]**	**Units**	**Analytical Results**					
Polycyclic Aromatic Hydrocarbons								
Acenaphthene	-	mg/kg	<0.04	<0.04	<0.04	<0.06	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05	<0.05	0.1	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	0.06	0.27	0.15	**0.84**	<0.05	0.105
Phenanthrene	5[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-3. Barge Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Barge			
		ALS Sample ID	Barge-10822-F-C	Barge-10823-F-C	Barge-11931-F-C	Barge-11935-F-C
		Date Sampled	24-May-04	24-May-04	07-Jul-04	05-Jul-04
		ALS File Number	U3969r	U3969r	U5597r	U5597r
		Field Screen (ppm)[b]				
Parameter	**CEQG[c]**	**Units**	**Analytical Results**			
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	-	mg/kg	<0.04	<0.05	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.08	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.08	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	<0.05	<0.2	<0.05	<0.05
Phenanthrene	5[d]	mg/kg	<0.05	0.053	0.131	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table BA-01-4. Barge Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee				Location	Barge							
				Sample ID	Barge-195-F-D	Barge-220-F-C	Barge-223-F-C	Barge-232-W-D	Barge-252-W-D	Barge-343-F-D	Barge-360-F-C	Barge-362-F-C
				Duplicate ID	QC# 359679	QC# 359678	Barge-225-F-Q	QC# 359680	QC# 361098	QC# 362845	Barge-363-F-Q	Barge-364-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**							
Analytical Laboratory Duplicates												
EPH C_{10}-C_{19}												
Sample Result	mg/kg	200	1000		-	-	463	-	-	-	1160	3290
Duplicate Result	mg/kg	200	1000		-	-	406	-	-	-	840	1930
RpD	**%**						na				na	**52%**
EPH C_{19}-C_{32}												
Sample Result	mg/kg	200	1000		-	-	<200	-	-	-	230	500
Duplicate Result	mg/kg	200	1000		-	-	<200	-	-	-	210	370
RpD	**%**						na				na	na
Analytical Laboratory Replicates												
EPH C_{10}-C_{19}												
Sample Result	mg/kg	200	1000		686	208	-	203	<200	<200	-	-
Duplicate Result	mg/kg	200	1000		889	<200	-	242	<200	<200	-	-
RpD	**%**				na	na		na	na	na		
EPH C_{19}-C_{32}												
Sample Result	mg/kg	200	1000		<200	<200	-	<200	<200	<200	-	-
Duplicate Result	mg/kg	200	1000		<200	<200	-	206	<200	<200	-	-
RpD	**%**				na	na		na	na	na		

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table BA-01-4. Barge Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee				Location	Barge						
				Sample ID	Barge 369-F-C	Barge-10615-BH-C	Barge-10730-W-C	Barge-10734-W-Q	Barge-10923-F-C	Barge-11549-F-Q	Barge-11933-F-C
				Duplicate ID	Barge 370-F-Q	QC# 386928	Barge-10734-W-Q	QC# 388375	QC# 388645	QC# 391814	Barge-11934-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
Analytical Laboratory Duplicates											
EPH C_{10}-C_{19}											
Sample Result	mg/kg	200	1000		1030	-	210	-	-	-	<200
Duplicate Result	mg/kg	200	1000		1200	-	<200	-	-	-	<200
RpD	**%**				15%		na				na
EPH C_{19}-C_{32}											
Sample Result	mg/kg	200	1000		250	-	470	-	-	-	380
Duplicate Result	mg/kg	200	1000		260	-	370	-	-	-	390
RpD	**%**				na		na				na
Analytical Laboratory Replicates											
EPH C_{10}-C_{19}											
Sample Result	mg/kg	200	1000		-	<200	-	<200	450	<200	-
Duplicate Result	mg/kg	200	1000		-	<200	-	230	400	<200	-
RpD	**%**					na		na	na	na	
EPH C_{19}-C_{32}											
Sample Result	mg/kg	200	1000		-	250	-	370	<200	<200	-
Duplicate Result	mg/kg	200	1000		-	300	-	440	<200	<200	-
RpD	**%**					na		na	na	na	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table BA-01-5. Barge Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee	Location	Barge								
	Sample ID	Barge 116-W-D	Shore-147-F-C	Barge-223-F-C	Shore-294-I-D	Barge 369-F-C	Barge-343-F-D	Shore 417-I-C	Shore-427-F	Barge-10730-W-C
	Duplicate ID	Barge 89-W-Q	Shore-33-F-Q	Barge-225-F-Q	Shore-37-I-Q	Barge 370-F-Q	QC# 362845	Shore 42-I-Q	QC# 356604	Barge-10734-W-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**						
On Site Field Screening Duplicates										
Lead (Pb)										
Sample Result	mg/kg	70	350	2171	494	237	1161	-	-	3108	-	-
Duplicate Result	mg/kg	70	350	2524	270	456	1592	-	-	3862	-	-
RpD	%			15%	na	na	31%			22%		
Zinc (Zn)										
Sample Result	mg/kg	150	750	13572	2183	506	12103	-	-	11718	-	-
Duplicate Result	mg/kg	150	750	14696	1427	420	16113	-	-	14384	-	-
RpD	%			8%	42%	na	28%			20%		
Analytical Laboratory Duplicates										
Lead (Pb)										
Sample Result	mg/kg	100	500	-	-	-	-	520	-	-	-	3010
Duplicate Result	mg/kg	100	500	-	-	-	-	800	-	-	-	2610
RpD	%							42%				14%
Zinc (Zn)										
Sample Result	mg/kg	2	10	-	-	-	-	2470	-	-	-	7170
Duplicate Result	mg/kg	2	10	-	-	-	-	2890	-	-	-	5900
RpD	%							16%				19%
Analytical Laboratory Replicates										
Lead (Pb)										
Sample Result	mg/kg	100	500	-	-	-	-	-	1930	-	1350	-
Duplicate Result	mg/kg	100	500	-	-	-	-	-	1470	-	1700	-
RpD	%								27%		23%	
Zinc (Zn)										
Sample Result	mg/kg	2	10	-	-	-	-	-	14800	-	5910	-
Duplicate Result	mg/kg	2	10	-	-	-	-	-	15700	-	8300	-
RpD	%								6%		34%	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table BA-01-5. Barge Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Barge							
				Sample ID	Barge-10823-F-C	Barge-11549-W-C	Shore-11590-W-C	Barge-11919-F-D	Barge-11933-F-C	Barge-11977-F-C	Barge-11978-F-Q	Barge-12088-F-D
				Duplicate ID	QC# 388645	QC# 391814	Shore-11707-W-Q	Barge-11986-F-Q	Barge-11934-F-Q	Barge-11978-F-Q	QC# 395283	Barge-12336-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**							
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350		-	-	-	-	-	-	-	3399
Duplicate Result	mg/kg	70	350		-	-	-	-	-	-	-	2971
RpD	%											13%
Zinc (Zn)												
Sample Result	mg/kg	150	750		-	-	-	-	-	-	-	24290
Duplicate Result	mg/kg	150	750		-	-	-	-	-	-	-	19320
RpD	%											23%
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		-	-	2998	<100	120	590	-	-
Duplicate Result	mg/kg	100	500		-	-	3089	120	120	380	-	-
RpD	%						3%	na	na	na		
Zinc (Zn)												
Sample Result	mg/kg	2	10		-	-	14543	217	427	3650	-	-
Duplicate Result	mg/kg	2	10		-	-	14973	472	587	4310	-	-
RpD	%						3%	**74%**	32%	17%		
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		1100	120	-	-	-	-	380	-
Duplicate Result	mg/kg	100	500		1060	280	-	-	-	-	350	-
RpD	%				4%	na					na	
Zinc (Zn)												
Sample Result	mg/kg	2	10		5870	329	-	-	-	-	4310	-
Duplicate Result	mg/kg	2	10		8980	209	-	-	-	-	5100	-
RpD	%				42%	45%					17%	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

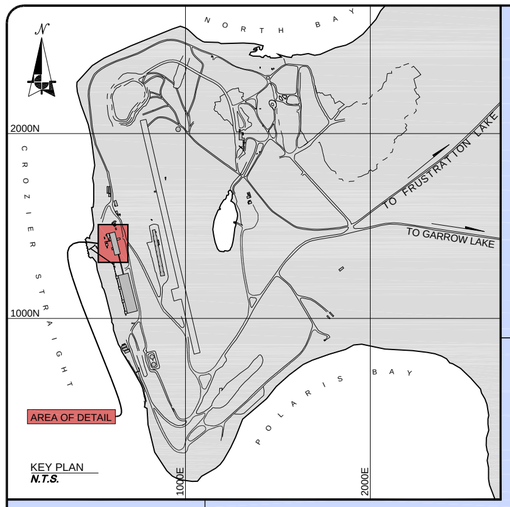
Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.



TO FIREHALL

BH-3 BH-2 MAIN PORTAL BH-4 BH-5 BH-1 BH-6 BH-7 BH-8 BH-9 BH-10

TP-202 TP-14 TP-8 TP-9 TP-15 TP-22 TP-16 TP-17 TP-11 TP-10 TP-18 TP-38 TP-12 TP-4 TP-3 TP-2 TP-20 TP-1 TP-21 TP-19 TP-37 TP-36 TP-39 TP-151 TP-35 TP-23 TP-25 TP-26 TP-5 TP-7 TP-6

SS 4 SS 10 SS 19 SS 18 SS TL1 SS 21 SS 12 SS 13 SS 6

BARGE

500 600 700 400

1500 1400 1300

LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

SOURCE OF DRAWING:

DRAWING INFORMATION:	
REVIEWED BY:	AL
DRAWN BY:	CHARONE
DATE ISSUED:	ISSUED – JUNE 10, 2005
PROJECT NUMBER:	40–137
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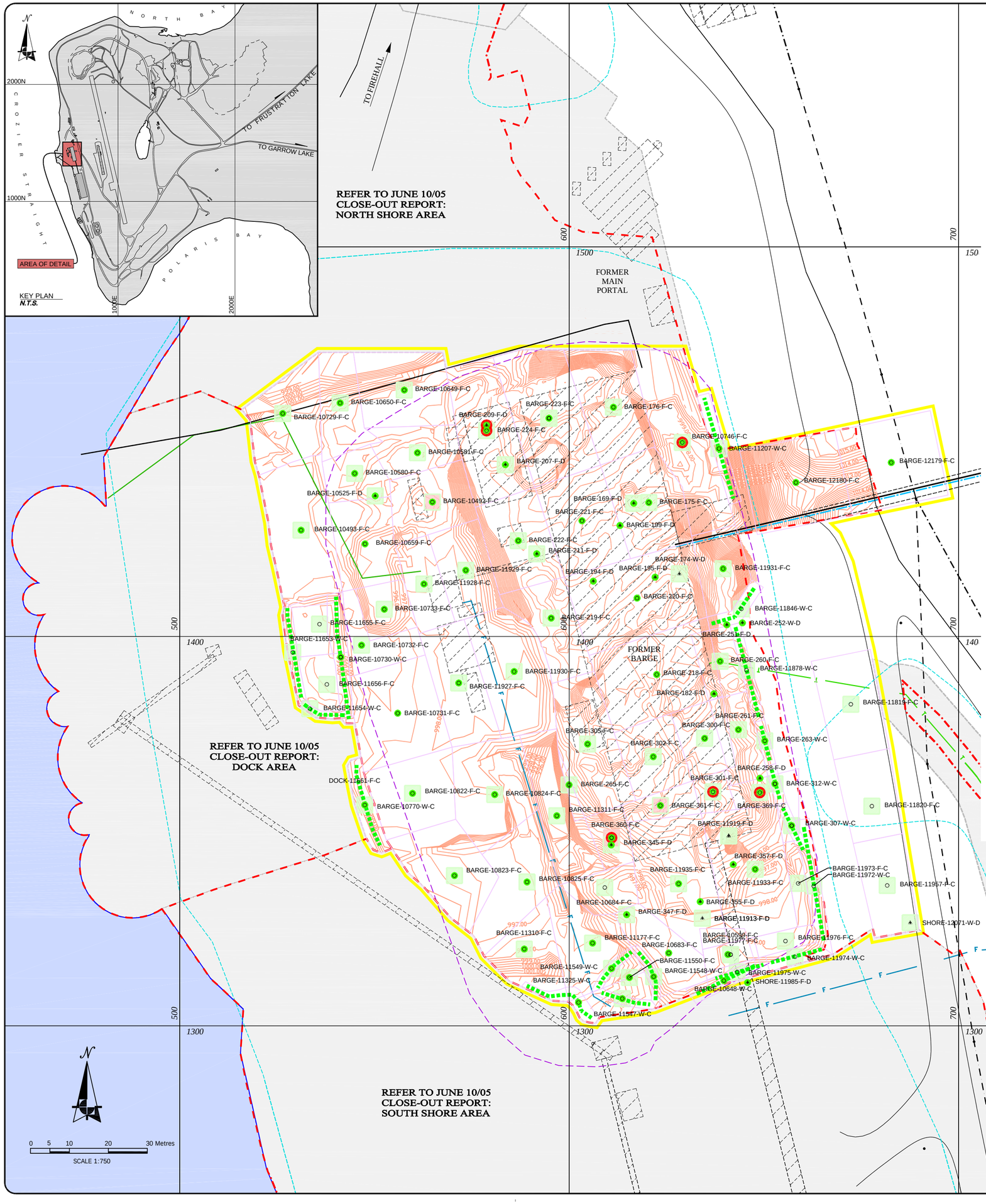
POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

BARGE CONDITIONS BEFORE REMEDIATION

Gartner Lee

FIGURE NO. BA-01-1



Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
Barge-169-F-D	<100	5
Barge-174-W-D	<200	5
Barge-175-F-C	<100	9
Barge-176-F-C	<100	10
Barge-207-F-D	<200	996
Barge-211-F-D	<200	766
Barge-219-F-C	<200	2630
Barge-222-F-C	<200	1280
Barge-223-F-C	237	506
Barge-224-F-C	<200	2040
Barge-225-F-Q duplicate of Barge-223-F-C	456	420
Barge260-F-C	<100	178
Barge261-F-C	<100	11.6
Barge263-W-C	1790	6670
Barge265-F-C	1030	8910
Barge300-F-C	120	475
Barge301-F-C	830	3000
Barge302-F-C	<100	294
Barge305-F-C	420	2150
Barge-307-W-C	1280	2240
Barge-312-W-C	1240	2720
Barge-345-F-D	1440	7050
Barge-347-F-D	720	4660
Barge-360-F-C	**5350**	**10200**
Barge-361-F-C	**5570**	3830
Barge-363-F-Q duplicate of Barge-360-F-C	440	2990
Barge-369-F-C	520	2470
Barge-370-F-Q duplicate of Barge-369-F-C	800	2890
Barge-10492-F-C	**2500**	4360
Barge-10493-F-C	870	2450
Barge-10525-F-D	370	1480
Barge-10580-F-C	1000	2210
Barge-10581-F-C	870	1720
Barge-10649-F-C	260	637
Barge-10650-F-C	260	2490
Barge-10684-F-C	970	6930
Barge-10729-F-C	160	500
Barge-10732-F-C	<200	173
Barge-10733-F-C	<200	220
Barge-10746-F-C	<100	200
Barge-10770-W-C	1600	6570
Barge-10822-F-C	<100	233
Barge-10823-F-C	1100	5870
Barge-10824-F-C	1980	9790
Barge-10825-F-C	640	3860
Barge-11177-F-C	740	6510
Barge-11207-W-C	1860	17.3
Barge-11310-F-C	550	8500
Barge-11311-F-C	1660	6590
Barge-11547-W-C	110	314
Barge-11548-W-C	150	374
Barge-11549-W-C	120	329
Barge-11550-F-C	190	501
Barge-11653-W-C	420	1040
Barge-11654-W-C	330	734
Barge-11655-F-C	380	862
Barge-11656-F-C	370	762
Barge-11819-F-C	275	808
Barge-11820-F-C	263	876
Barge-11846-W-C	390	1170
Barge-11874-F-C	<100	103
Barge-11878-W-C	<100	117
Barge-11913-F-D	1570	2330
Barge-11919-F-D	<100	217
Barge-11927-F-C	<100	43.3
Barge-11928-F-C	<100	36.1
Barge-11929-F-C	<100	32
Barge-11930-F-C	<100	55.8
Barge-11931-F-C	<100	55.4
Barge-11933-F-C	120	427
Barge-11934-F-Q duplicate of Barge-11933-F-C	120	587
Barge-11935-F-C	180	653
Barge-11957-F-C	170	469
Barge-11972-W-C	130	376
Barge-11973-F-C	210	636
Barge-11974-W-C	370	3390
Barge-11975-W-C	710	4030
Barge-11976-F-C	310	4900
Barge-11977-F-C	590	3650
Barge-11978-F-Q duplicate of Barge-11977-F-C	380	4310
Barge-11986-F-Q duplicate of Barge-11919-F-C	120	472
Barge-12071-W-D	295	473

Confirmation Sample ID	EPH C10-C19a mg/kg	EPH C19-C32a mg/kg
Barge-169-F-D	<200	<200
Barge-175-F-C	<200	<200
Barge-176-F-C	240	<200
Barge-182-F-D	724	<200
Barge-194-F-D	<200	<200
Barge-195-F-D	686	<200
Barge-199-F-D	554	<200
Barge-207-F-D	259	<200
Barge-209-F-D	**2380**	<200
Barge-211-F-D	206	<200
Barge-218-F-C	210	<200
Barge-219-F-C	<200	<200
Barge-220-F-C	208	<200
Barge-221-F-C	230	<200
Barge-222-F-C	436	<200
Barge-223-F-C	463	<200
Barge-224-F-C	**1340**	<200
Barge-225-F-Q duplicate of Barge-223-F-C	406	<200
Barge-251-F-D	<200	<200
Barge252-W-D	<200	<200
Barge258-F-D	<200	<200
Barge260-F-C	<200	<200
Barge261-F-C	<200	<200
Barge263-W-C	590	<200
Barge265-F-C	<200	<200
Barge300-F-C	<200	<200
Barge301-F-C	**1030**	210
Barge302-F-C	<200	<200
Barge305-F-C	<200	<200
Barge-312-W-C	<200	<200
Barge-345-F-D	330	<200
Barge-347-F-D	450	<200
Barge-355-F-D	780	230
Barge-357-F-D	320	<200
Barge-360-F-C	**1160**	230
Barge-361-F-C	970	210
Barge-363-F-Q duplicate of Barge-360-F-C	840	210
Barge-369-F-C	**1030**	250
Barge-370-F-Q duplicate of Barge-369-F-C	**1200**	260
Barge-10492-F-C	660	210
Barge-10493-F-C	<200	<200
Barge-10525-F-D	<200	<200
Barge-10580-F-C	<200	<200
Barge-10581-F-C	<200	<200
Barge-10599-F-C	<200	<200
Barge-10648-W-C	<200	260
Barge-10649-F-C	<200	320
Barge-10650-F-C	200	380
Barge-10659-F-C	<200	<200
Barge-10683-F-C	860	270
Barge-10729-F-C	<200	<200
Barge-10730-W-C	210	470
Barge-10731-F-C	<200	220
Barge-10732-F-C	<200	<200
Barge-10733-F-C	<200	<200
Barge-10734-W-Q duplicate of Barge-10730-W-C	<200	370
Barge-10746-F-C	**1520**	480
Barge-10770-W-C	270	260
Barge-10822-F-C	<200	210
Barge-10823-F-C	450	<200
Barge-10824-F-C	<200	<200
Barge-10825-F-C	200	<200
Barge-11177-F-C	<200	<200
Barge-11207-W-C	900	350
Barge-11310-F-C	210	270
Barge-11311-F-C	<200	<200
Barge-11325-W-C	<200	230
Barge-11547-W-C	<200	<200
Barge-11548-W-C	<200	<200
Barge-11549-W-C	<200	<200
Barge-11550-F-C	<200	<200
Barge-11927-F-C	340	520
Barge-11928-F-C	<200	380
Barge-11929-F-C	230	380
Barge-11930-F-C	250	440
Barge-11931-F-C	280	480
Barge-11933-F-C	<200	380
Barge-11934-F-Q duplicate of Barge-11933-F-C	<200	390
Barge-11935-F-C	<200	240
SHORE-11985-F-D	<200	<200
Barge-12179-F-C	<200	230
Barge-12180-F-C	<200	220

Bold — **Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- T — TAILINGS LINE
- T — TAILINGS LINE (FORMER)
- F — FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

ESP–7–I–D
- AREA
- SAMPLE ID
- TYPE– C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA WALL–5 SAMPLES ALONG 25m OF WALL; D= DISCRETE SAMPLE; Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
- LOCATION– F= FLOOR SAMPLE; I= INTERMEDIATE FLOOR SAMPLE; W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

BARGE CONDITIONS AFTER REMEDIATION

Gartner Lee

FIGURE NO. BA-01-2

Appendix B

Ship Loading Dock

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald,

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Dock Area

BACKGROUND

The dock structure was located 100 m west of the process barge that contained the former mill and office complex (shown as Area 2 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*). The dock consisted of four main cells with a 92 m long docking face approximately 20 m high, with a minimum of 14 m draft below the mean sea water level. The four cells were constructed through the ice in the winter of 1981 by driving interlocking sheet pilings into the ice and backfilling them with rock. During construction approximately 45 pipes at 1 m spacing were emplaced in the fill to circulate glycol coolant to freeze the rock fill.

The dock contained a shiploading tower that was connected to the concentrate storage building by a conveyor-way. A fuel distribution pipeline and electrical services ran along the conveyor-way to the shiploader.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified Lead and Zinc contamination in the soil at the dock area from surface to a depth of 0.3 m. During the ESA two test pits and one borehole were drilled adjacent to the east side of the dock cells. Seven soil samples were submitted for analysis of hydrocarbons and five soil samples were submitted for Lead and Zinc analysis. Water samples were collected from the borehole in 1999 and 2000 and analysed for metals, glycol and volatile organic compounds. No samples were collected within the dock cells. No hydrocarbon or glycol contamination was encountered during the ESA. The original topography of the area, soil sample results from the ESA, as well as the area estimated during the ESA to be an area of concern, are shown on Figure Dock-02-01.

METHODOLOGY

Delineation

The preliminary boundaries of the remediation area, as identified in the ESA as "Areas of Concern", were further delineated for excavation on the basis of field screening measurements from soil samples obtained from fifteen (15) test pits and eighteen (18) boreholes in May, June and July 2003. Fifty five (55) soil samples were collected from the test pits and included seven (7) discrete samples collected at 0.05 m to 0.36 m intervals based on the visual appearance of the walls of the test pit and forty eight (48) composite samples collected over 0.15 m or 0.3 m intervals. The boreholes were advanced with an air rotary quarry drill and composite soil samples were collected over 0.8 m (2.5 feet) intervals to a depth of 4.0 m (13 feet). The soil samples were collected from the drill returns that accumulated at the mouth of the borehole onto a flat metal footplate. Following the collection of each sample the surface of the footplate was cleared of the drill cuttings.

Visual appearance and odour of the soil, along with field screening measurements obtained from the boreholes and test pits were used to delineate the area to be excavated. The hydrocarbon field screening measurements were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. The samples were field screened for metals using the Niton X-ray fluorescence (XRF) elemental analyser in accordance with Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols.

Based on results of the field screening sampling, it was determined that the entire Dock area would require excavation of metal contaminated soils. Hydrocarbon contamination was found to be present adjacent to the shiploader tower in Dock Cell 2 and in the soil to the east of the Dock Cells. Hydrocarbon contamination was also found to be present in the soil adjacent to Dock Cell 2, in part of Dock Cell 1, and 3. No hydrocarbon contamination was detected in Dock Cell 4.

Excavation

Prior to excavation of the dock cells, the glycol in pipes that were installed in the dock was recovered. Excavation of the soils in the dock area commenced June 21, 2003 and it was completed July 9, 2004 following a break in activities over the winter. The 2003 excavation concentrated on Dock Cells 1 and 2 and the area on the east side of these Dock Cells. Dock Cells 3 and 4 were left in place to allow the ship a point to moor in August 2003. The contaminated soils were removed from Dock Cells 1 and 2 and the sheet piling was cut at the high water level.

In 2004, the contaminated soil in Dock Cells 3 and 4 was excavated. Excavation within the Dock Cells commenced May 11, 2004 and was completed by June 3, 2004. The reclamation plan required the sheet piling from the Dock Cells to be cut at a depth of 3 m below the low tide elevation. Divers were commissioned in April, May and June 2004 to cut the sheet piling after the contaminated soil was removed from all the Dock Cells. Contaminated soil east of the Dock Cells continued to be excavated until July 5, 2004 when field screening results indicated that the Soil Quality Remediation Objectives (SQRO's) would be met.

Due to its proximity to the ocean and foreshore environment, special consideration was taken to minimise the impact to the marine environment. The influx of water into the dock cells could not be prevented, as such; mitigation measures were required to prevent the mobilisation of hydrocarbons and to reduce sedimentation into the marine environment. Water was removed from the excavation using conventional pumps, which were placed in sumps at the lowest portion of the excavation. The water was pumped into a sediment pond, which was lined with geotextile filters to screen out sediment. The water was then skimmed of any residual hydrocarbon sheen and released to the marine environment. Sediment curtains were also installed along the perimeter of the dock cells to filter sediments escaping the dock cells during high tides. Total suspended solids (TSS) levels were monitored daily along the shoreline during periods of work at predetermined stations in accordance with approved site procedures and protocols.

Excavators were used to remove materials from the Dock area. A ripper tooth attached to an excavator was used to break up the frozen and compacted ground to a depth of approximately 1.0 m. The second step in excavating the area utilised a bucket on the excavator to scoop up the material the ripper had lossened. The use of the ripper tooth was repeated until all the contaminated soil was removed from the Dock area. The Contaminated soils were loaded directly into trucks and disposed of in the underground mine workings in accordance with regulatory approvals.

Soil samples were collected across the floor and walls of the excavation. The visual appearance and odour of the soil along with the field screening measurements obtained with the PID and the XRF analyzer were used to further direct the excavation. The limits of the excavation are shown on Figure FH-21-2: *Dock Conditions After Remediation*.

Confirmation Sampling

Samples to confirm the absence of Glycol contamination were collected adjacent to pipes prior to excavation activities commencing as shown in the table below. Upon receipt of the analytical results that demonstrated the absence of Glycol contamination, excavation activities commenced.

Location of Samples Tested for Glycol

Sample ID	Northing	Easting	Location
Dock-62-I	468.4	1433.7	Dock Cell 4
Dock-63-I	464.0	1422.7	Dock Cell 4
Dock-66-I	473.6	1407.8	Dock Cell 3
Dock-67-I	467.4	1396.3	Dock Cell 3
Dock-72-I	485.7	1353.9	Dock Cell 1
Dock-73-Q	485.7	1353.9	Dock Cell 1
Dock-74-I	480.8	1340.9	Dock Cell 1
Dock-264-F-C	478.3	1396.5	Dock Cell 3
Dock-265-F-C	470.7	1424.0	Dock Cell 4

Upon receipt of field screening results that indicated that the soil remaining in the excavation would meet the SQRO's, confirmation soil samples were collected. The excavation area was subdivided into individual composite sampling areas approximately 25 m by 25 m or less as required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation.

Soil samples were collected at the excavation limits and submitted to ALS Environmental for analysis of EPH, metals, Polycyclic Aromatic Hydrocarbons (PAH) and Glycol. Additional excavation was undertaken in areas that did not meet the SQRO's and additional confirmatory samples taken upon completion of excavation. Upon receipt of the analytical results that met the SQRO's the final excavation limits were surveyed.

ANALYTICAL RESULTS

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with collecting and analyzing soil were implemented during the remediation of the Dock area, including the comparison of on-site field screening samples, the submission of blind duplicates to the analytical laboratory, and the analysis of analytical laboratory replicates. Relative percent differences (RpDs) have been calculated and compiled in Tables DO-02-5 for five (5) on-site field screened duplicates, three (3) analytical laboratory duplicates, and two (2) analytical laboratory replicates for Lead and Zinc concentrations for a total ten (10) QA/QC samples.

Seven (7) of the sample results and their duplicate/replicate results returned acceptable RpDs, below the site specific remediation protocol of 50%. Two other samples returned results below the practical quantitation limit, in which case the RpD value has been identified as "na" (not

applicable). One analytical laboratory replicate sample, Shore-498-F-C returned a RpD for Zinc concentrations of 59%, which is above the objective. The variance between the sample and its replicate is considered indicative of sample heterogeneity in an area previously contaminated with Lead and Zinc concentrate dust.

Discussion

Analytical laboratory results for EPH, metals, PAH and Glycol are summarized in Tables DO-02-1, DO-02-2, DO-02-3 and DO-02-4 respectively, along with the approved Polaris Mine SQROs for petroleum hydrocarbons and metals. A total of fifteen (15) hydrocarbon, twenty six (26) metal and nine (9) glycol samples were submitted from the former Dock area. Of the hydrocarbon samples, there were thirteen (13) composite floor samples and two (2) composite wall samples. The twenty six (26) metal samples consisted of twenty two (22) composite floor samples, one (1) composite wall sample, and three (3) quality assurance and quality control (QA/QC) duplicate samples. Seven (7) Glycol samples were collected from the surface of the dock cells prior to excavation to verify the absence of the substance prior to remediation and two (2) Glycol samples were collected from the base of the excavation limits.. The soil quality results for EPH, Lead and Zinc and the lateral limits of the excavation are shown on Figure DOCK-02-2.

Fifteen (15) samples were analysed for EPH, of this set, four (4) randomly selected samples were extracted for PAH. All samples analysed for PAH returned values below the SQROs. All of the hydrocarbon remediation confirmation samples returned results below the Polaris mine SQROs.

All the metal remediation confirmation samples returned results below the Polaris Mine SQRO's for Lead and Zinc. Total metal analyses were performed on four (4) randomly selected confirmation samples. Two samples, DOCK-203-F-C, and DOCK-11546-F-C, returned Barium concentrations greater than the generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Parkland land use of 500 mg/kg Barium in soil. The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

The presence of Barium concentrations in the soil above the generic CCME guidelines for parkland land use is attributed to natural background mineralogy. Barium is a common mineral associated with lead sulphides, and it is found in cavities in limestone and dolostone.

Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results,* are considered to be representative of background conditions. Samples were collected at the following intervals surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of Barium greater than generic CCME CEQG Parkland land use were detected in each interval. The variability of Barium concentrations in those samples is listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The concentrations of Barium remaining within the footprint of the Dock area after remediation are within the range of the background concentrations. In addition, the immobile nature of the Barium encountered on site was demonstrated in the ESA leachate test results that returned Barium concentrations at levels less than the detection limit and it was therefore not identified as a contaminant of concern in the ESA.

All of the samples submitted for Glycol analysis met the generic CCME guideline and returned results below the method detection limit of 10 mg/kg indicating no Glycol contaminated soil was present at the dock area.

The confirmatory samples supported by the QA/QC samples from the Dock area provide confidence that the remediation of the dock area complies with the SQROs.

CONCLUSIONS

Based on confirmatory sampling, consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the Dock area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Dennis Lu, B.Sc.
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Arlene Laudrum, P.Geol.
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AL:DL:gc

ATTACHMENTS

Tables

Table DO-02-1:	Dock Area Remediation Confirmation Soil Samples – Hydrocarbons
Table DO-02-2:	Dock Area Remediation Confirmation Soil Samples – Metals
Table DO-02-3:	Dock Area Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table DO-02-4:	Dock Area Remediation Soil Screening Samples – Glycols
Table DO-02-5:	Dock Area Quality Assurance and Quality Control Remediation Soil Samples – Metals

Figures

Figure DO-02-1:	Dock Conditions Before Remediation
Figure DO-02-2:	Dock Conditions After Remediation

Table DO-02-1. Dock Area Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Dock						
		Sample ID	Dock-202-F-C	Dock-203-F-C	Dock-259-F-C	Dock-260-F-C	Dock-264-F-C	Dock-265-F-C	Dock-10744-F-C
		Date Sampled	28-Aug-03	28-Aug-03	03-Oct-03	03-Oct-03	07-Oct-03	07-Oct-03	20-May-04
		ALS File Number	T3582	T3582	T4927	T4927	T5093	T5093	U3898r
		Field Screen (ppm)[b]	-	-	-	-	-	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	<200	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	<200	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table DO-02-1. Dock Area Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Dock					
		Sample ID	Dock-11169-F-C	Dock-11214-F-C	Dock-11215-F-C	Dock-11312-W-C	Dock-11313-F-C	Dock-11481-W-C
		Date Sampled	04-Jun-04	02-Jun-04	02-Jun-04	01-Jun-04	31-May-04	15-Jun-04
		ALS File Number	U4269r	U4269r	U4269r	U4137	U4137	U4704r
		Field Screen (ppm)[b]	45	-	-	-	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	560	520	<200	<200	390
EPH C_{19}-C_{32}	1000	mg/kg	<200	400	390	<200	<200	<200
LEPH[c]	1000	mg/kg	<200	-	-	-	-	390
HEPH[c]	1000	mg/kg	<200	-	-	-	-	<200

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table DO-02-1. Dock Area Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Dock	
		Sample ID	Dock-11482-F-C	Dock-11696-F-C
		Date Sampled	15-Jun-04	28-Jun-04
		ALS File Number	U4704r	U5223
		Field Screen (ppm)[b]	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**	
Extractable Hydrocarbons				
EPH C_{10}-C_{19}	1000	mg/kg	<200	220
EPH C_{19}-C_{32}	1000	mg/kg	<200	440
LEPH[c]	1000	mg/kg	-	220
HEPH[c]	1000	mg/kg	-	440

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table DO-02-02. Dock Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Dock						
				Sample ID	Dock-76-F-C	Dock-77-F-C	Dock-80-F-Q	Dock202-F-C	Dock203-F-C	Dock-259-F-C	Dock-260-F
				Date Sampled	24-Jun-03	24-Jun-03	24-Jun-03	28-Aug-03	28-Aug-03	03-Oct-03	03-Oct-03
				ALS File Number	S9893	S9893	S9893	T3582	T3582	T4927	T4927
				Field Screen Pb (ppm)[b]	-	-	duplicate of	-	-	-	-
				Field Screen Zn (ppm)[b]	-	-	Dock-77-F-C	-	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-		8.3	-	-	-	8.49	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	<20	-	-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	<10	-	-	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	432	-	-	-	**677**	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<1	-	-	-	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	8	-	-	-	4	-	-
Chromium	T-Cr	-	64	mg/kg	5	-	-	-	8	-	-
Cobalt	T-Co	-	50[d]	mg/kg	<4	-	-	-	<4	-	-
Copper	T-Cu	-	63	mg/kg	6	-	-	-	11	-	-
Lead	T-Pb	2000	-	mg/kg	619	431	554	199	327	443	<100
Mercury	T-Hg	-	6.6	mg/kg	<0.05	-	-	-	<0.05	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<8	-	-	-	<8	-	-
Nickel	T-Ni	-	50	mg/kg	<10	-	-	-	10	-	-
Selenium	T-Se	-	1	mg/kg	<4	-	-	-	<3	-	-
Silver	T-Ag	-	20[d]	mg/kg	<4	-	-	-	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	<10	-	-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	14	-	-	-	21	-	-
Zinc	T-Zn	10000	-	mg/kg	3970	2600	2940	970	1250	3260	471

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table DO-02-02. Dock Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Dock						
				Sample ID	Dock-262-I	Dock-263-F-C	Shore-426-F	Shore-427-F	Shore-433-F-Q	Shore-498-F-C	Shore-499-F-C
				Date Sampled	07-Oct-03	07-Oct-03	23-Sep-03	23-Sep-03	23-Sep-03	23-Oct-03	23-Oct-03
				ALS File Number	T5093	T5345	T4504	T4504	T4504	T5790	T5790
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	-	-	-	duplicate of	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	-	-	-	Shore-427-F	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-		-	-	-	8.57	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<20	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	<10	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	371	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	13	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	<4	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	<4	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	5	-	-	-
Lead	T-Pb	2000	-	mg/kg	977	778	1680	1350	1920	1360	860
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	<0.05	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	<10	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<4	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<10	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	11	-	-	-
Zinc	T-Zn	10000	-	mg/kg	3140	3540	8370	5910	7020	5310	3260

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines.The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table DO-02-02. Dock Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Dock					
				Sample ID	Dock-10646-F-C	Dock-11482-F-C	Dock-11545-F-C	Dock-11546-F-C	Dock-11627-F-C	Dock-11628-F-Q
				Date Sampled	13-May-04	15-Jun-04	17-Jun-04	17-Jun-04	22-Jun-04	22-Jun-04
				ALS File Number	U3564rr	U4704r	U4781	U4781	U4948	U4948
				Field Screen Pb (ppm)[b]	-	-	86	92	54	duplicate of
				Field Screen Zn (ppm)[b]	-	-	307	287	115	Dock-11627-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-		-	-	-	8.37	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	**578**	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1.0	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	<1.0	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	9.3	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	5.2	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	21.1	-	-
Lead	T-Pb	2000	-	mg/kg	930	430	<50	<100	<100	<100
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	0.103	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8.0	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	28	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<4.0	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4.0	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	73.3	-	-
Zinc	T-Zn	10000	-	mg/kg	1490	1680	75.4	93.7	105	158

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines.The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table DO-02-02. Dock Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Dock					
				Sample ID	Dock-11660-F-C	Dock-11661-F-C	Dock-11843-F-C	Dock-11844-F-C	Dock-11845-F-C	Dock-11936-F-C
				Date Sampled	25-Jun-04	25-Jun-04	01-Jul-04	01-Jul-04	01-Jul-04	04-Jul-04
				ALS File Number	U5050	U5050	U5353r	U5353r	U5353r	U5597r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	296	269	135	116	80	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	996	877	483	433	161	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-		-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	260	240	490	120	<100	<100
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	631	478	252	325	83.9	99.5

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines.The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table DO-02-03. Dock Area Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Dock			
		Sample ID	Dock-265-F	Dock-11169-F-C	Dock-11481-W-C	Dock-11696-F-C
		Date Sampled	07-Oct-03	04-Jun-04	15-Jun-04	28-Jun-04
		ALS File Number	T5093	U4269r	U4704r	U5223
		Field Screen (ppm)[b]		45	-	-
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**			
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	-	mg/kg	<0.04	<0.04	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05	0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	<0.05	<0.05	0.52	<0.05
Phenanthrene	5[d]	mg/kg	<0.05	<0.05	<0.05	0.091
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table DO-02-4. Dock Area Remediation Soil Screening Samples - Glycol

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Dock								
		Sample ID	Dock-72-I	Dock-73-Q	Dock-74-I	Dock-62-I	Dock-63-I	Dock-66-I	Dock-67-I	Dock-264-F	Dock-265-F
		Date Sampled	23-May-03	duplicate of	23-May-03	23-May-03	23-May-03	23-May-03	23-May-03	07-Oct-03	07-Oct-03
		ALS File Number	S8646	Dock-72-I	S8646	S8646	S8646	S8646	S8646	T5093	T5093
Parameter	**CEQG (PL)[b]**	**Units**	**Analytical Results**								
Glycols											
Diethylene_Glycol	-	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylene_Glycol	97[c]	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10
12_Propylene_Glycol	-	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

c) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table DO-02-5. Dock Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee	Location	Dock									
	Sample ID	Dock-77-F-C	Shore-427-F-C	Dock-11627-F-C	Dock-11627-F-C	Dock-11627-F-C	Dock-85-I-D	Dock-222-I-D	Shore-294-I-D	Shore-427-F-C	Shore-498-F-C
	Duplicate ID	Dock-80-F-Q	Shore-433-F-Q	Dock-11628-F-Q	Dock-11628-F-Q	Dock-11710-F-Q	Dock-86-I-Q	Dock-203-I-Q	Shore-37-I-Q	QC# 356604	QC# 361306
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**							
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350	-	-	-	54	54	2650	951	1162	-	-
Duplicate Result	mg/kg	70	350	-	-	-	16	35	2720	1266	1592	-	-
RpD	%						na	na	3%	28%	31%		
Zinc (Zn)											
Sample Result	mg/kg	150	500	-	-	-	115	115	16998	2216	12103	-	-
Duplicate Result	mg/kg	150	500	-	-	-	147	182	16294	3425	16113	-	-
RpD	%						na	na	4%	43%	28%		
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500	431	1350	<100	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500	554	1920	<100	-	-	-	-	-	-	-
RpD	%			na	35%	na							
Zinc (Zn)											
Sample Result	mg/kg	3	15	2600	5910	105	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15	2940	7020	158	-	-	-	-	-	-	-
RpD	%			12%	17%	40%							
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500	-	-	-	-	-	-	-	-	1350	1360
Duplicate Result	mg/kg	100	500	-	-	-	-	-	-	-	-	1700	1900
RpD	%											23%	33%
Zinc (Zn)											
Sample Result	mg/kg	3	15	-	-	-	-	-	-	-	-	5910	5310
Duplicate Result	mg/kg	3	15	-	-	-	-	-	-	-	-	8300	9800
RpD	%											34%	**59%**

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

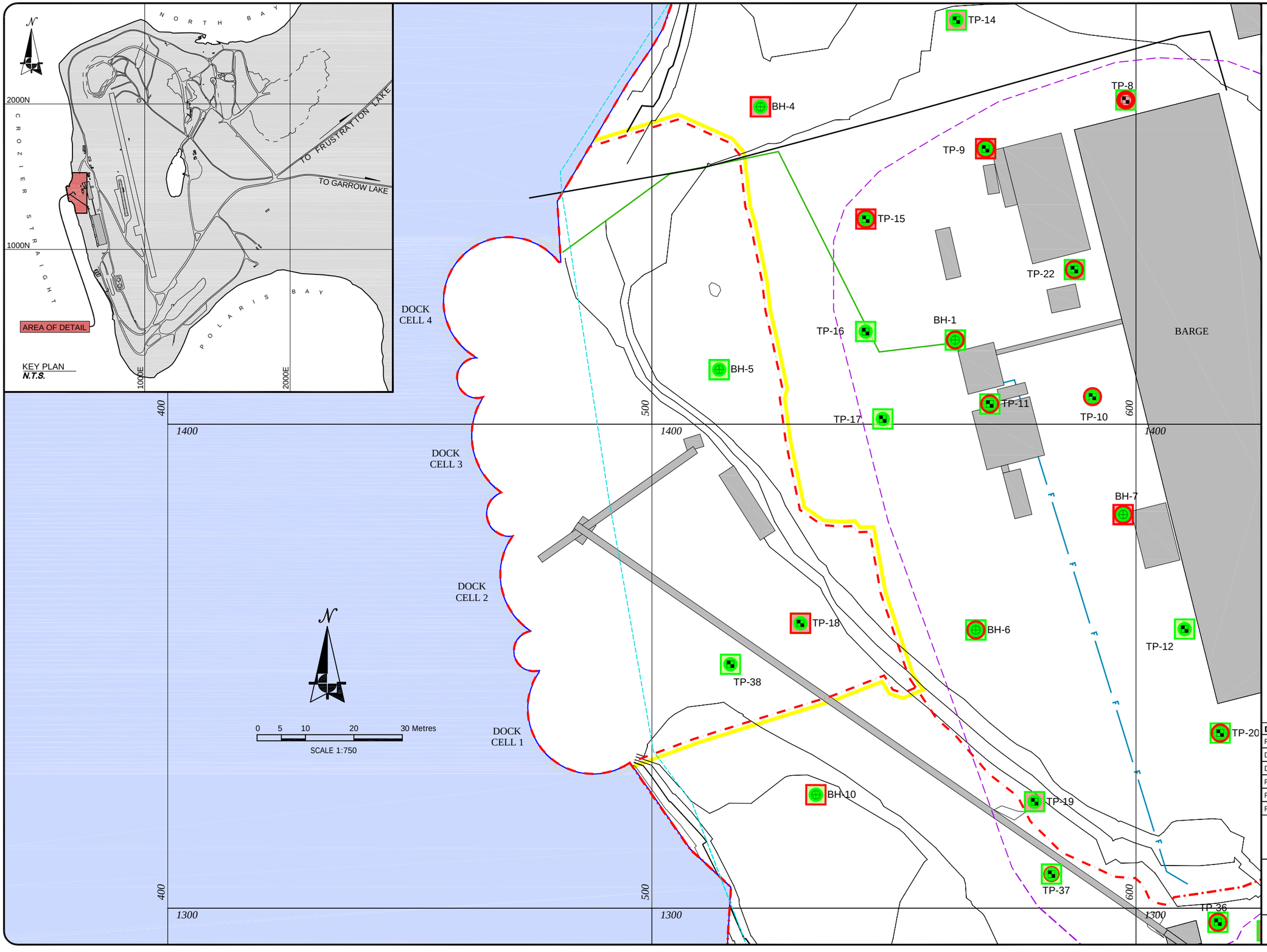
Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.



LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

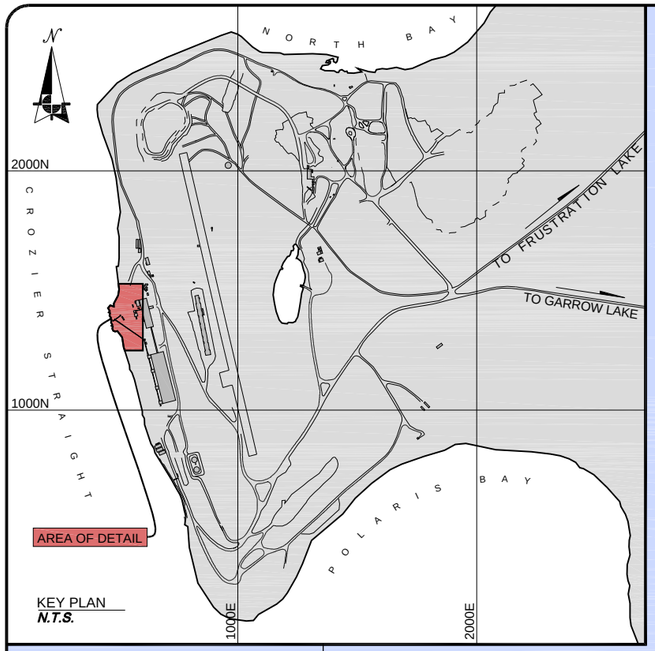
DRAWING INFORMATION:	
REVIEWED BY:	AL
DRAWN BY:	CHARONE
DATE ISSUED:	ISSUED – JUNE 10, 2005
PROJECT NUMBER:	40–137
FILE NAME:	40137–DOCK–M1–01.DWG
REVISION:	0

POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

DOCK CONDITIONS BEFORE REMEDIATION

Gartner Lee

Figure No.
DO-02-1



REFER TO JUNE 10/05 CLOSE-OUT REPORT: NORTH SHORE AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: BARGE AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: SOUTH SHORE AREA

DOCK CELL 4

DOCK CELL 3

DOCK CELL 2

DOCK CELL 1

FORMER BARGE

DOCK-11936-F-C
DOCK-11546-F-C
DOCK-11845-F-C
DOCK-11844-F-C
DOCK-265-F-C
DOCK-263-F-C
DOCK-10646-F-C
SHORE-499-F-C
DOCK-11545-F-C
SHORE-498-F-C
DOCK-259-F-C
DOCK-11313-F-C
DOCK-264-F-C
DOCK-262-I
SHORE-426-F-C
DOCK-260-F-C
SHORE-427-F-C
BARGE-11653-W-C
DOCK-11312-W-C
DOCK-11169-F-C
DOCK-10744-F-C
DOCK-11627-F-C
DOCK-11660-F-C
DOCK-11696-F-C
DOCK-11481-W-C
DOCK-11482-F-C
DOCK-11843-F-C
DOCK-11215-F-C
DOCK-77-F-C
DOCK-202-F-C
DOCK-11661-F-C
DOCK-76-F-C
DOCK-203-F-C
DOCK-11214-F-C

400
1400
600
500
1300

N

0 5 10 20 30 Metres

SCALE 1:750

Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
Dock-76-F	619	3970
Dock-77-F	431	2600
Dock-80-F-Q duplicate of Dock-77-F-C	554	2940
Dock-202-F-C	199	970
Dock-203-F-C	327	1250
Dock-259-W-C	443	3260
Dock-260-F	<100	471
Dock-262-I	977	3140
Dock-263-F-C	778	3540
Shore-426-F	1680	8370
Shore-427-F	1350	5910
Shore-433-F-Q duplicate of Shore-427-F-C	1920	7020
Shore-498-F-C	1360	5310
Shore-499-F-C	860	3260
Dock-10646-F-C	930	1490
Dock-11482-F-C	430	1680
Dock-11545-F-C	<50	75.4
Dock-11546-F-C	<100	93.7
Dock-11627-F-C	<100	105
Dock-11628-F-Q duplicate of Shore-11627-F-C	<100	158
Dock-11660-F-C	260	631
Dock-11661-F-C	240	478
Dock-11843-F-C	490	252
Dock-11844-F-C	120	325
Dock-11845-F-C	<100	83.9
Dock-11936-F-C	<100	99.5

Confirmation Sample ID	EPH C10-C19 mg/kg	EPH C19-C32 mg/kg
Dock202-F-C	<200	<200
Dock203-F-C	<200	<200
Dock-259-F	<200	<200
Dock-260-F	<200	<200
Dock-264-F	<200	<200
Dock-265-F	<200	<200
Dock-10744-F-C	<200	<200
Dock-11169-F-C	<200	<200
Dock-11214-F-C	560	400
Dock-11215-F-C	520	390
Dock-11312-W-C	<200	<200
Dock-11313-F-C	<200	<200
Dock-11481-W-C	390	<200
Dock-11482-F-C	<200	<200
Dock-11696-F-C	220	440

Bold	**Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

AREA – SAMPLE ID – TYPE – LOCATION

ESP–7–I–D

- C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA WALL–5 SAMPLES ALONG 25m OF WALL
- D= DISCRETE SAMPLE
- Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
- F= FLOOR SAMPLE
- I= INTERMEDIATE FLOOR SAMPLE
- W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- *EPH – EXTRACTABLE PETROLEUM HYDROCARBONS
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

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REVIEWED BY:	AL
DRAWN BY:	CHARONE
DATE ISSUED:	ISSUED – JUNE 10, 2005
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FILE NAME:	40137–DOCK–M2–01.DWG
REVISION:	0

POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

DOCK CONDITIONS AFTER REMEDIATION

Gartner Lee

Figure No. **DO-02-2**

Appendix C

Accommodation Complex

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Accommodation Complex

BACKGROUND

The Accommodation Complex (shown as Area 5 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*) was located near the crest of the slope overlooking the former mill and office complex within the barge, and concentrate storage shed.

The foundations lied on about 1.5 m of sand and gravel fill, which overlies fractured limestone. The active soil zone is approximately 0.6 m deep. The building was raised above the existing grade by 1.2 m to 2.1 m, permitting preservation of the thermal regime under the building. The foundations consisted of concrete pads and columns, and the footprint of the building covered an area of 5,120 m^2. The building was an all-steel construction.

There were about 240 rooms in four residential modules, each module was connected to the other by alternating service modules containing the kitchen and dining room, commissary and swimming pool, nursing station and offices. The electrical/mechanical services module was at the north end of the building, and included three 450 kw emergency generators, the vacuum sewage system, fire pumps, boilers, laundry and glycol heat transfer system. An above ground storage diesel tank, used for the emergency generators, was located at the northeast side of the Accommodation Complex. Primary heat supply was from a glycol waste heat recovery system attached to the barge diesel generators. Food freezers, coolers and dry goods storage were located at the south end of the building beneath a gymnasium. During demolition a truck wash station was operated at the north end of the Accommodation Complex.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified hydrocarbon contamination in the soil at the north end of the accommodation complex. Petroleum hydrocarbon contamination was observed in test pits excavated adjacent to the above-ground storage tank (AST) and at the north side of the building. The eastern, up-gradient extent of hydrocarbon contamination was delineated during the ESA. Figure ACC-05-1: *Accommodation Complex Conditions Before Remediation* illustrates the original topography of the area, sample

results from the ESA, as well as the area estimated by the ESA as an area of concern for hydrocarbon contamination.

METHODOLOGY

Delineation

The preliminary boundary of the remedial area, as identified in the ESA as an "Area of Concern", was further delineated through the drilling of boreholes on October 25, 2003. A total of six boreholes were drilled using the air rotary quarry drill at the northwest corner of the accommodation complex, on the downgradient side of the building.

The borehole investigation also served to investigate the presence of contamination resulting from the use of the wash station during demolition. Each hole was drilled to a depth of three meters, and composite soil samples were collected over 0.6 m intervals. The soil samples were collected from the drill returns that accumulated at the mouth of the borehole. Following the collection of each sample the surface surrounding the borehole was cleared of the drill cuttings, and fresh snow was exposed.

The visual appearance and odour of the soil was used to delineate the area to be excavated, along with field screening measurement of the concentrations of organic vapours in the composite soil samples. The field screening measurements were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. As a result of the October 25, 2004 drilling, the interpreted extent of the area to be remediated was revised as indicated by the "Limit of Remedial Excavation" shown on Figure ACC-05-1.

Excavation

Excavation of the contaminated soils at the Accommodation Complex began on July 5, 2004, prior to the demolition of the Accommodations Complex. At this time only the northwestern portion of the delineated hydrocarbon contamination was excavated due to limited access and vehicle safety concerns.

Demolition of the Accommodation Complex commenced August 4, 2004 and was completed by August 27, 2004. Excavation of remaining hydrocarbon contaminated soil that had been previously delineated started August 17, 2004, and was completed by September 4, 2004.

Soil within the excavation boundaries was ripped and loaded out into trucks with an excavator. The excavation was completed in two lifts, each approximately 0.6 m thick.

The final limits of the excavation are shown on Figure ACC-05-2: *Accommodation Complex Conditions After Remediation*. An in-situ volume of approximately 2,000 m^3 was excavated from the former Accommodation Complex area. This material was disposed of in the underground mine workings in accordance with regulatory approvals.

Confirmation Sampling

Field screening sampling was undertaken at the base of the first lift and along the excavation boundaries to determine where additional excavation was required to meet the Soil Quality Remediation Objectives (SQROs).

Soil samples were collected across the floor and along the wall of the excavation limits in accordance with Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols. Soil samples were collected at the final excavation limits and sent to the analytical laboratory, ALS Environmental for extractable petroleum hydrocarbons (EPH) and polycyclic aromatic hydrocarbons (PAH). Composite samples were collected from areas of the floor approximately 25 m x 25 m and over a length of 25 m along the perimeter walls of the excavation.

The results of field sampling indicated that a second excavation pass was required over the eastern portion of the area delineated by the ESA. The re-excavated area was sampled again, and field-screening results indicated that the remaining soil exposed across the excavation would meet the SQROs. The excavation limits were surveyed, and are show on Figure ACC-05-2.

ANALYTICAL RESULTS

Analytical laboratory results for EPH and PAH are summarized in Tables ACC-05-1 and ACC-05-02 respectively, along with the approved Polaris Mine SQRO's for petroleum hydrocarbons.

A total of fifteen (15) confirmation soil samples from the former Accommodation Complex were submitted for laboratory analysis. The fifteen remediation confirmation soil samples were collected as follows: six (6) composite floor samples, one (1) discrete floor, six (6) composite walls, and two (2) quality assurance/quality control (QA/QC) duplicate samples. The soil quality results and the lateral limits of the excavation are shown on Figure ACC-05-2.

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with collecting and analyzing soil were implemented during the remediation of the Accommodations Complex area, including the submission of blind duplicates to the analytical laboratory, analysis of analytical laboratory replicates, and comparison of

analytical laboratory EPH results with the portable photoionization detector (PID) organic vapour headspace measurements.

Relative percent differences (RpDs) have been calculated and compiled in Table ACC-05-03 for the two (2) analytical laboratory duplicates and three (3) laboratory replicate results. The laboratory duplicate and replicates returned results below the practical quantitation limit, in which case the RpD value has been identified as "na" (not available).

Confirmation Sample Results

All samples were analyzed for EPH, and two samples were analyzed for PAH. The two samples submitted for PAH analyses were collected from the floor of the excavation where the hydrocarbon contamination had been the most pervasive.

A discrete sample was collected from the same area as a composite sample, and both were submitted for laboratory analysis. The results are as follows:

Summary of Discrete Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	EPH C_{10}-C_{19} (mg/kg)	EPH C_{19}-C_{32} (mg/kg)	Discrete Sample ID	EPH C_{10}-C_{19} (mg/kg)	EPH C_{19}-C_{32} (mg/kg)
ACC-12182-F-C	<200	<200	ACC-12186-F-D	280	<200

All confirmatory soil sample results from the Accommodation Complex met the SQRO's set forth for the Polaris Mine.

CONCLUSIONS

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the former Accommodation Complex area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of

such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgment in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Brenda Bolton, B.A., B.Sc.
Environmental Geologist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

AL:BB:gc

ATTACHMENTS

Tables

Table ACC-05-1: Accommodation Complex Remediation Confirmation Soil Samples – Hydrocarbons
Table ACC-05-2: Accommodation Complex Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table ACC-05-3: Accommodation Complex Quality Assurance and Quality Control Remediation Soil Samples – Hydrocarbons

Figures

Figure ACC-05-1: Accommodation Complex Conditions Before Remediation
Figure ACC-05-2: Accommodation Complex Conditions After Remediation

Table ACC 05-1. Accomodation Complex Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Accommodation Complex							
		Sample ID	ACC-11749-F-C	ACC-11923-W-C	ACC-11924-W-C	ACC-12163 -W-C	ACC-12164-F-C	ACC-12168-F-Q	ACC-12165-F-C	ACC-12166-F-C
		Date Sampled	05-Jul-04	06-Jul-04	06-Jul-04	20-Aug-04	20-Aug-04	20-Aug-04	20-Aug-04	20-Aug-04
		ALS File Number	U5597r	U5597r	U5597r	U7328	U7328	duplicate of	U7328	U7328
		Field Screen (ppm)[b]	10	25	25	10	10	ACC-12164-F-C	15	15
Parameter	**Site Specific[b]**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	200	290	380	280	380	380
EPH C_{19}-C_{32}	1000	mg/kg	<200	310	320	520	780	500	550	700
LEPH[c]	1000	mg/kg	-	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table ACC 05-1. Accomodation Complex Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Accommodation Complex						
		Sample ID	ACC-12167-W-C	ACC-12181-F-C	ACC-12182-F-C	ACC-12183-F-Q	ACC-12184-W-C	ACC-12185-W-C	ACC-12186-F-D
		Date Sampled	20-Aug-04	28-Aug-04	28-Aug-04	28-Aug-04	28-Aug-04	28-Aug-04	28-Aug-04
		ALS File Number	U7328	U7700	U7700	duplicate of	U7700	U7700	U7700
		Field Screen (ppm)[b]	20	20	25	ACC-12182-F-C	10	15	10
Parameter	**Site Specific[b]**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	320	<200	<200	<200	<200	<200	280
EPH C_{19}-C_{32}	1000	mg/kg	620	<200	<200	<200	340	<200	<200
LEPH[c]	1000	mg/kg	-	-	<200	<200	-	-	-
HEPH[c]	1000	mg/kg	-	-	<200	<200	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table ACC-05-2. Accommodation Complex Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Accommodation Complex	
		ALS Sample ID	ACC-12182-F-C	ACC-12183-F-Q
		Date Sampled	28-Aug-04	28-Aug-04
		ALS File No	U7700	duplicate of
		Field Screening (ppm)[b]	25	ACC-12182-F-C
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**	
Polycyclic Aromatic Hydrocarbons				
Acenaphthene	-	mg/kg	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05
Napthalene	0.6	mg/kg	0.06	0.078
Phenanthrene	5[d]	mg/kg	<0.05	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter. quality guideline were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table ACC-05-3. Accommodation Complex Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee				Location	Accommodation Complex				
					Analytical Laboratory Duplicates		Analytical Laboratory Replicates		
				Sample ID	ACC-12182-F-C	ACC-12164-F-C	ACC-11923-W-C	ACC-12165-F-C	ACC-12183-F-Q
				Duplicate ID	ACC-12183-F-Q	ACC-12168-F-Q	QC#395245	QC#402847	QC#404398
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**		**Analytical Results**		
Extractable Hydrocarbons									
EPH C_{10}-C_{19}									
Sample Result	mg/kg	200	1000		<200	280	<200	380	<200
Duplicate Result	mg/kg	200	1000		<200	380	240	280	<200
RpD	**%**				na	na	na	na	na
EPH C_{19}-C_{32}									
Sample Result	mg/kg	200	1000		<200	500	310	550	<200
Duplicate Result	mg/kg	200	1000		<200	780	380	520	<200
RpD	**%**				na	na	na	na	na

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

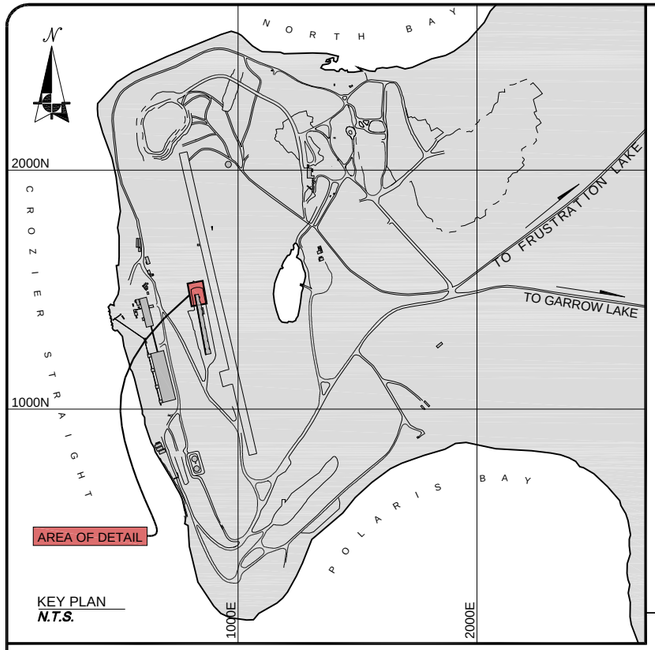
Notes:

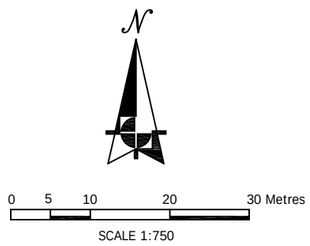
na *RpD value is not applicable because one or both results are less than the PQL.*

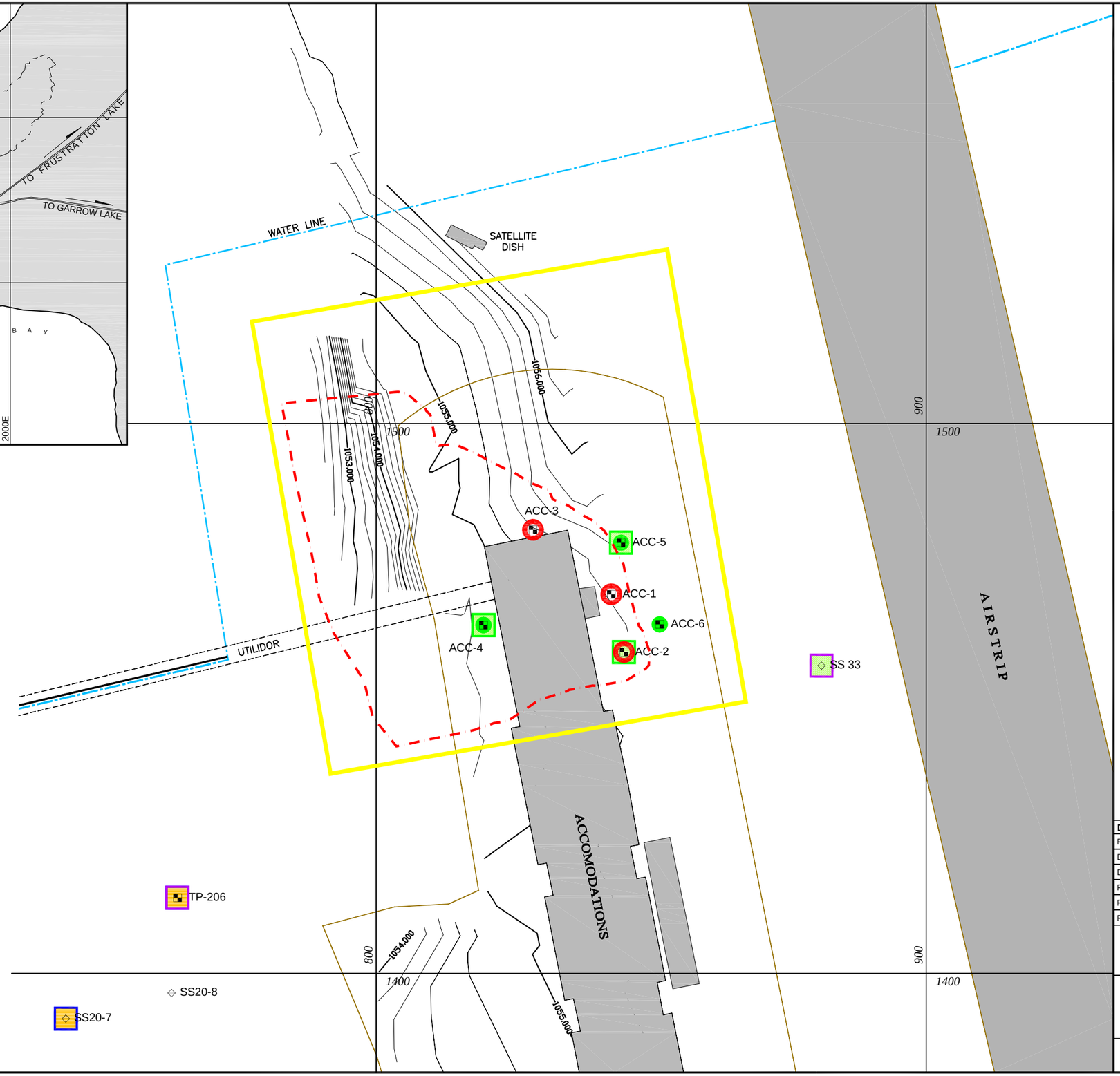
RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*







LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20-6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

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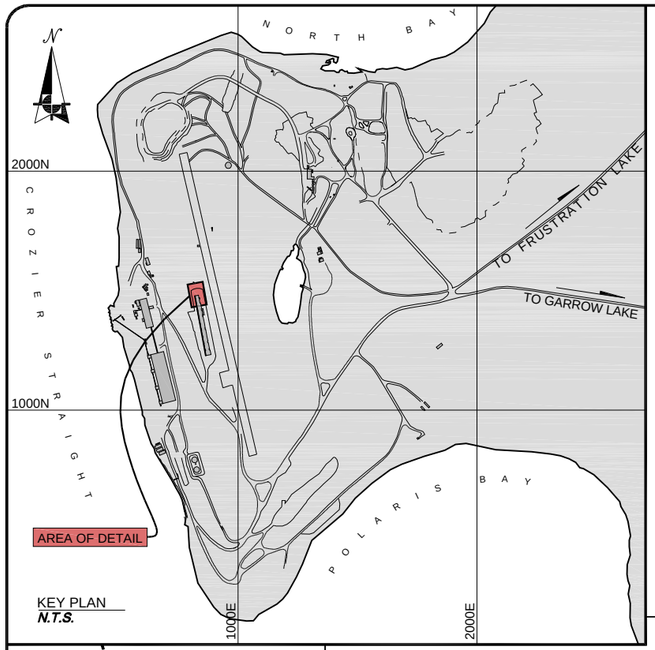
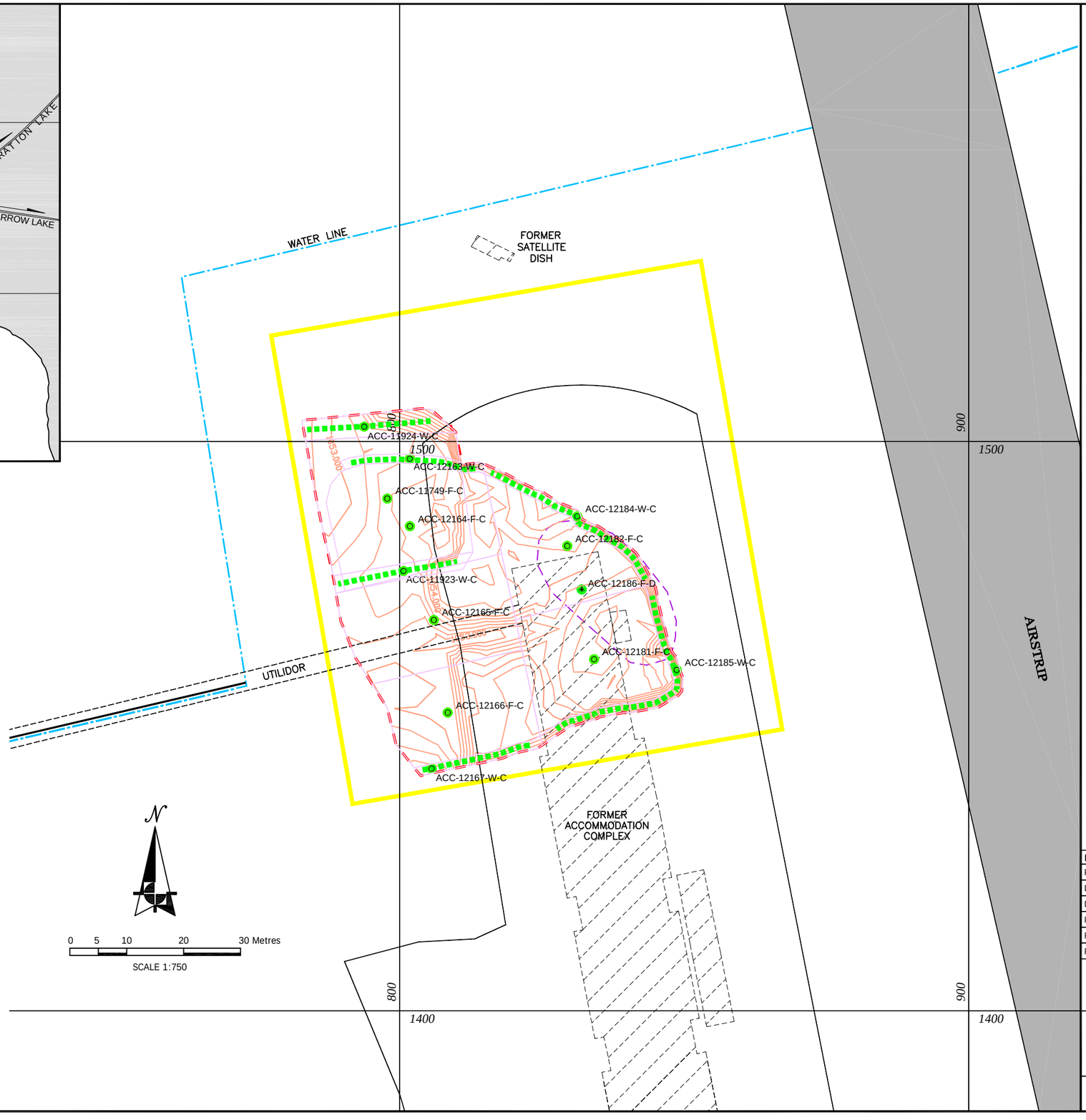
POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

ACCOMMODATION COMPLEX CONDITIONS BEFORE REMEDIATION

Gartner Lee

Figure No. ACC-05-1





Confirmation Sample ID	EPH C10-C19[a] mg/kg	EPH C19-C32[a] mg/kg	LEPH[a] mg/kg	HEPH[a] mg/kg
ACC-11749-F-C	<200	<200	-	-
ACC-11923-W-C	<200	310	-	-
ACC-11924-W-C	200	320	-	-
ACC-12163 -W-C	290	520	-	-
ACC-12164-F-C	380	780	-	-
ACC-12165-F-C	380	550	-	-
ACC-12166-F-C	380	700	-	-
ACC-12167-W-C	320	620	-	-
ACC-12168-F-Q duplicate of ACC-12164-F-C	280	500	-	-
ACC-12181-F-C	<200	<200	-	-
ACC-12182-F-C	<200	<200	<200	<200
ACC-12183-F-Q duplicate of ACC-12182-F-C	<200	<200	<200	<200
ACC-12184-W-C	<200	340	-	-
ACC-12185-W-C	<200	<200	-	-
ACC-12186-F-D	280	<200	-	-

Bold	**Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

AREA – SAMPLE ID

ESP-7-I-D

TYPE:
- C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA WALL–5 SAMPLES ALONG 25m OF WALL
- D= DISCRETE SAMPLE
- Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE

LOCATION:
- F= FLOOR SAMPLE
- I= INTERMEDIATE FLOOR SAMPLE
- W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

ACCOMMODATION COMPLEX CONDITIONS AFTER REMEDIATION

Gartner Lee

Figure No. ACC-05-2

Appendix D

Foldaway Buildings

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Foldaway Buildings

BACKGROUND

The foldaway buildings were located south of the former concentrate storage shed and to the west of the former fuel tank farm, shown as Area 7 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan , December 31, 2004.*

The foldaway buildings and adjacent temporary dock were some of the first facilities constructed at the Polaris Mine site. During the operation of the mine, the foldaway buildings were used for vehicle storage. During demolition the buildings served as mechanical shops. Fuel and lubricants were stored and handled in this area during the construction, operation and demolition of the mine.

A snow dump, located north of the foldaway buildings, was used during mine operations. The Foldaway Snow Dump area is shown as Area 19 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan , December 31, 2004*. Snow from the south end of the Concentrate Storage Shed and from around the Foldaway Buildings was occasionally deposited into a snow dump in this area.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified petroleum hydrocarbon contamination present in the soil surrounding the foldaway buildings. Soil samples collected from test pits up to 15 m away from the buildings determined that hydrocarbon contamination extended from surface to greater than 1.0 m below ground level. The ESA did not identify hydrocarbon contaminated soil test pits excavated more than 15 m from the buildings.

In the vicinity of the Foldaway Snow Dump, the ESA documented the presence of total lead and zinc concentrations greater than the site-specific Soil Quality Remediation Objectives (SQROs) in one of six sites sampled for metals.

The original topography of the area, sample locations and results, and the preliminary remediation area that was indicated as a concern for either metal and hydrocarbon contamination by the ESA investigations, are shown on Figure FA-07-1: *Foldaway Buildings Conditions Before Remediation*.

METHODOLOGY

Delineation

The preliminary boundaries of the remediation areas, as identified in the ESA as "Areas of Concern", were delineated for excavation on the basis of field screening measurements obtained from twenty-one (21) boreholes drilled and sampled in 2003, and from an additional forty-five (45) boreholes drilled and sampled in 2004. Boreholes were advanced with an air rotary quarry drill and with a mobile rotary drill mounted on an excavator. Composite soil samples were collected over 0.8 m (2.5 feet) intervals to a depth of 6.0 m (20 feet). The soil samples were collected from the drill returns that accumulated at the mouth of the borehole onto a flat metal footplate. Following the collection of each sample the surface of the footplate was cleared of the drill cuttings.

The visual appearance and odour of the soil, along with field screening measurements obtained from the borehole samples were used to delineate the area to be excavated. The hydrocarbon field screening measurements were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. The samples were field screened for metals using the Niton X-ray fluorescence (XRF) elemental analyser. Based on results of the field screening sampling, GLL modified the extent of the area to be excavated as indicated by the "Limit of Remedial Excavation" shown on Figure FA-07-1.

Excavation

Excavation of the soils underlying and surrounding the foldaway buildings occurred from May 28 to July 9, 2004. Due to its proximity to the ocean and foreshore environment, the excavation was completed in two stages. The first stage consisted of demolition of the buildings and removal of soils, while leaving a berm between the ocean and the excavation to limit the interaction with the foreshore environment. An isolated occurrence of liquid petroleum hydrocarbons was encountered at the northeast corner of the foldaway buildings and this product was pumped into barrels and incinerated on site. The second stage was the removal of the berm. The majority of contaminated soils were removed from the footprint of the buildings before excavation of the berm proceeded. The berm was excavated only during periods of low tide.
Total suspended solids (TSS) levels were monitored daily during periods of work in the foreshore along the shoreline at predetermined stations in accordance with approved site procedures and protocols.

Excavators were used to remove materials from the foldaway building area. The first pass on each lift utilised a ripper tooth to break up frozen and compacted ground. The second pass utilised a bucket to scoop up the loose material. Contaminated material was stockpiled on the footprint of the foldaways then loaded into trucks for disposal. To further direct the excavation, soil samples were collected across the floor excavation limits in accordance with standard GLL and TCL sampling procedures and protocols. These samples were field screened using the PID to evaluate hydrocarbon concentrations, and the XRF to evaluate metal concentrations in order to determine where additional excavation was required to meet the SQROs. The northern extent of the Foldaway Snow Dump was not excavated since field screening results indicated the area would meet the SQROs. The limits of the excavation are shown on Figure FA-07-2: *Foldaway Buildings Conditions After Remediation*.

All material excavated was disposed of in the mine workings in accordance with regulatory approvals.

Confirmation Sampling

Upon receipt of field screening results that indicated that the material remaining in the excavation would meet the SQRO's, confirmation samples were collected in accordance with Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols. The floor of the excavated area was subdivided into individual composite sampling areas approximately 25 m by 25 m required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation. Composite samples were created by collecting four or five evenly spaced aliquots of soil within the individual composite sample area. A discrete sample is a single aliquot of soil from a specific point and these samples were collected randomly.

The soil samples were collected at the excavation limits and submitted to ALS Environmental (ALS) for analysis of Extractable Petroleum Hydrocarbons (EPH), metals and Polycyclic Aromatic Hydrocarbons (PAH). Additional excavation was undertaken in areas where the laboratory analytical results did not meet the SQRO's and additional confirmatory samples were taken upon completion of the excavation. Upon receipt of analytical results that met the SQROs the final excavation limits were surveyed and the area backfilled to final grade.

ANALYTICAL RESULTS

Analytical laboratory results for EPH, metals and PAH are summarized in Tables FA-07-1, FA-07-2 and FA-07-3 respectively, along with the approved Polaris Mine SQROs for petroleum hydrocarbons and metals. A total of thirty one (31) hydrocarbon and five (5) metals samples were submitted for the foldaway building area. Of the hydrocarbon samples, there were sixteen (16) composite floors, nine (9) composite walls, two (2) discrete walls and four (4) Quality

Assurance/Quality Control (QA/QC) duplicate samples. The five (5) metals samples consisted of four (4) composite floors and one (1) QA/QC duplicate sample. The soil quality results and the lateral limits of the excavation are shown on Figure FA-12-2.

Quality Assurance and Quality Control (QA/QC)

Relative percent differences (RpDs) have been calculated and compiled in Tables FA-07-4 for hydrocarbons and FA-07-5 for metals; two (2) on site field screened duplicates, five (5) analytical laboratory duplicates, three (3) analytical laboratory replicates were compiled for a total of ten (10) QA/QC samples.

Eight (8) of the sample results and their duplicate/replicate results returned results below the Practical Quantitation Limit (PQL) in which case the RpD value has been identified as "n/a" (not applicable). One sample pairing (FA-11758-F-C and FA-11770-F-Q) was prepared as both an on site field screened duplicate and an analytical laboratory duplicate. The on site field screened duplicate RpDs were 19% for Lead and 30% for Zinc, which is below the site specific remediation protocol of 50%. The analytical laboratory duplicate RpD for Zinc was 185%. No RpD for Lead could be calculated since the duplicate results was below the PQL. This sample, FA-11758-F-C, was the one confirmation soil sample that returned concentrations of Lead and Cadmium above the SQROs. The sample duplicate, FA-11700-F-Q returned a result of below the SQRO for Lead.

The variance between the on site field screening results, and the laboratory sample and its duplicate is likely due to sample heterogeneity caused by the presence of zinc concentrate dust in the sample collected outside of the excavation limits. Therefore, the metal QA/QC samples from the Foldaway Buildings area serve to document the variable nature of the metal concentrations in the soil.

Discussion

Thirty one (31) samples were analysed for EPH, of this set, four randomly selected samples were extracted for PAH. All samples analysed for PAH returned values below the SQROs. All of the hydrocarbon remediation confirmation samples returned results below the Polaris mine SQRO's.

Two discrete samples were collected and submitted for laboratory analysis of hydrocarbons along with composite samples collected in the same area and results were as follows:

Summary of Discrete Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	EPH C_{10}-C_{19} (mg/kg)	EPH C_{19}-C_{32} (kg/kg)	Discrete Sample ID	EPH C_{10}-C_{19} (µg/kg)	EPH C_{19}-C_{32} (mg/kg)
FA-11170-W-C	<200	<200	FA-11127-W-D	<200	<200
FA-11145-W-C	330	<200	FA-11206-W-D	270	<200

Total metals analysis was performed on the sample that yielded the highest field screening result, FA-11758-F-C. The sample returned concentrations of Lead (2,290 mg/kg) above the SQRO of 2,000 mg/kg as well as Cadmium concentration (14 mg/kg) above the generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guideline (CEQG) for parkland land use of 10 mg/kg. Cadmium was not identified as a contaminant of concern in the total metal analyses and leachate analyses conducted during the ESA. The approved site-specific remedial objectives allow for minor exceedances in a small percentage (less than 5%) of the confirmatory sample area, so long as the concentration is less than twice the remedial target. The total area of the foldaway building excavation was 6,790 m^2, of that; the sample (FA-11758-F-C) covered an area of 230 m^2. The total area not meeting the SQRO but falling below twice the remedial target in the foldaway area is 3.4%. In addition, given the immobile nature of the Cadmium encountered on site, as demonstrated by the leachate results and the relatively low level of concentrations, no further remedial excavation work is considered necessary to meet the approved closure plan objectives.

The confirmation samples supported by the QA/QC samples from the Foldaway Buildings area provide confidence that the remediation of the foldaway area complies with the SQRO's.

CONCLUSIONS

Based on confirmatory sampling, consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the foldaway building area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

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ATTACHMENTS

Tables

Table FA-07-1:	Foldaway Buildings Remediation Confirmation Soil Samples – Hydrocarbons
Table FA-07-2:	Foldaway Buildings Remediation Confirmation Soil Samples – Metals
Table FA-07-3:	Foldaway Buildings Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table FA-07-4:	Foldaway Buildings Quality Assurance and Quality Control Remediation Soil Samples – Hydrocarbons
Table FA-07-5:	Foldaway Buildings Quality Assurance and Quality Control Remediation Soil Samples – Metals

Figures

Figure FA-07-1:	Foldaway Buildings Conditions Before Remediation
Figure FA-07-2:	Foldaway Buildings Conditions After Remediation

Table FA-07-1. Foldaway Buildings Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Foldaway Buildings						
		Sample ID	FA-11127-W-D	FA-11145-W-C	FA-11170-W-C	FA-11173-F-C	FA-11174-F-Q	FA-11206-W-D	FA-11331-F-C
		Date Sampled	June 3, 2004	June 3, 2004	June 4, 2004	June 3, 2004	June 4, 2004	June 2, 2004	June 8, 2004
		ALS File Number	U4269R	U4269R	U4269R	U4269R	duplicate of	U4269R	U4378
		Field Screen (ppm)[b]	30	45	-	-	FA-11173-F-C	40	-
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	330	<200	<200	<200	270	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FA-07-1. Foldaway Buildings Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Foldaway Buildings						
		Sample ID	FA-11333-W-C	FA-11371-W-Q	FA-11334-F-C	FA-11358-F-C	FA-11365-W-C	FA-11624-F-C	FA-11625-W-C
		Date Sampled	June 9, 2004	June 9, 2004	June 9, 2004	June 10, 2004	June 9, 2004	June 22, 2004	June 22, 2004
		ALS File Number	U4484	duplicate of	U4484	U4484	U4484	U4948	U4948
		Field Screen (ppm)[b]	45	FA-11333-W-C	40	50	45	40	40
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	290	820	<200	<200	240
EPH C_{19}-C_{32}	1000	mg/kg	550	320	300	800	380	<200	390
LEPH[c]	1000	mg/kg	-	-	-	820	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	800	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FA-07-1. Foldaway Buildings Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Foldaway Buildings						
		Sample ID	FA-11626-W-C	FA-11632-F-C	FA-11689-F-C	FA-11766-F-C	FA-11847-F-C	FA-11745-F-Q	FA-11848-F-C
		Date Sampled	June 22, 2004	June 23, 2004	June 28, 2004	July 7, 2004	July 2, 2004	July 2, 2004	July 2, 2004
		ALS File Number	U4948	U5050	U5223	U5598	U5353R	duplicate of	U5353R
		Field Screen (ppm)[b]	45	15	10	-	5	FA-11847-F-C	10
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	210	<200	<200	250	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	320	280	300	450	340	440	400
LEPH[c]	1000	mg/kg	-	-	-	250	<200	-	-
HEPH[c]	1000	mg/kg	-	-	-	450	340	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FA-07-1. Foldaway Buildings Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Foldaway Buildings					
		Sample ID	FA-11849-F-C	FA-11850-F-C	FA-11851-F-C	FA-11875-W-C	FA-11876-W-C	FA-11877-W-C
		Date Sampled	July 2, 2004	July 2, 2004	July 2, 2004	July 4, 2004	July 4, 2004	July 4, 2004
		ALS File Number	U5353R	U5353R	U5353R	U5597	U5597	U5597
		Field Screen (ppm)[b]	10	10	5	20	10	15
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	210	240	240	230
EPH C_{19}-C_{32}	1000	mg/kg	360	390	440	450	420	370
LEPH[c]	1000	mg/kg	-	-	-	-	240	-
HEPH[c]	1000	mg/kg	-	-	-	-	420	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FA-07-1. Foldaway Buildings Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Foldaway Buildings			
		Sample ID	FA-11969-F-C	FA-11970-F-C	FA-11769-F-Q	FA-11971-F-C
		Date Sampled	July 9, 2004	July 9, 2004	July 8, 2004	July 9, 2004
		ALS File Number	U5615R	U5615R	duplicate of	U5615R
		Field Screen (ppm)[b]	25	25	FA-11970-F-C	25
Parameter	**Site Specific**	**Units**	**Analytical Results**			
Extractable Hydrocarbons						
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	230
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	430
LEPH[c]	1000	mg/kg	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FA-07-2. Foldaway Buildings Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Foldaway Buildings				
				Sample ID	FA-11358-F-C	FA-11758-F-C	FA-11770-F-Q	FA-11932-F-C	FA-11969-F-C
				Date Sampled	June 10, 2004	July 12, 2004	July 12, 2004	July 7, 2004	July 9, 2004
				ALS File Number	U4484	U5836	U5836	U5597R	U5615R
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	157	972	duplicate of	98	-
				Field Screen Zn (ppm)[b]	897	6704	FA-11758-F-C	135	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**				
pH		-	-	-	-	8.74	-	-	-
Total Metals									
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	-	-	-
Arsenic	T-As	-	12	mg/kg	-	<10	-	-	-
Barium	T-Ba	-	500	mg/kg	-	205	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	<1	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	**13.7**	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	5	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	<4	-	-	-
Copper	T-Cu	-	63	mg/kg	-	8	-	-	-
Lead	T-Pb	2000	-	mg/kg	850	**2290**	<100	<100	<200
Mercury	T-Hg	-	6.6	mg/kg	-	<0.05	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	<10	-	-	-
Selenium	T-Se	-	1	mg/kg	-	<4	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	<4	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	<10	-	-	-
Vanadium	T-V	-	130	mg/kg	-	25	-	-	-
Zinc	T-Zn	10000	-	mg/kg	986	5370	214	50	1480

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FA-07-3. Foldaway Buildings Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Foldaway Buildings			
		Sample ID	FA-11358-F-C	FA-11766-F-C	FA-11847-F-C	FA-11876-W-C
		Date Sampled	June 10, 2004	July 7, 2004	July 2, 2004	July 4, 2004
		ALS File Number	U4484	U5598R	U5353R	U5597
		Field Screen (ppm)[b]	50	-	5	10
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**			
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	-	mg/kg	<0.06	<0.04	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.08	<0.05	<0.06
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	0.07	<0.05	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	<0.4	<0.05	<0.05	<0.05
Phenanthrene	5[d]	mg/kg	<0.05	0.167	<0.05	0.139
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline include: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FA-07-4. Foldaway Buildings Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee				Location	Foldaway Buildings						
					Analytical Laboratory Duplicates				Analytical Laboratory Replicates		
				Sample ID	FA-11173-F-C	FA-11333-W-C	FA-11847-F-C	FA-11970-F-C	FA-11173-F-C	FA-11850-F-C	FA-11875-W-C
				Duplicate ID	FA-11174-F-Q	FA-11371-W-Q	FA-11745-F-Q	FA-11769-F-Q	QC#389861	QC#394457	QC#395246
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**				**Analytical Results**		
Extractable Hydrocarbons											
EPH C_{10}-C_{19}											
Sample Result	mg/kg	200	1000		<200	<200	<200	<200	<200	<200	240
Duplicate Result	mg/kg	200	1000		<200	<200	<200	<200	<200	220	300
RpD	**%**				na	na	na	na	na	na	22%
EPH C_{19}-C_{32}											
Sample Result	mg/kg	200	1000		<200	550	340	<200	<200	390	450
Duplicate Result	mg/kg	200	1000		<200	<200	<200	<200	<200	450	510
RpD	**%**				na	na	na	na	na	14%	12%

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table FA-07-5. Foldaway Buildings Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee			Location	Foldaway Buildings	
			Sample ID	FA-11932-F-C	FA-11758-F-C
			Duplicate ID	FA-11792-F-Q	FA-11770-F-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**	
On Site Field Screening Duplicates					
Lead (Pb)					
Sample Result	mg/kg	20	100	86	972
Duplicate Result	mg/kg	20	100	61	807
RpD	%			na	19%
Zinc (Zn)					
Sample Result	mg/kg	60	300	<60	6704
Duplicate Result	mg/kg	60	300	<60	4978
RpD	%			na	30%
Analytical Laboratory Duplicates					
Lead (Pb)					
Sample Result	mg/kg	100	500	-	2290
Duplicate Result	mg/kg	100	500	-	<100
RpD	%				na
Zinc (Zn)					
Sample Result	mg/kg	3	15	-	5370
Duplicate Result	mg/kg	3	15	-	214
RpD	%				**185%**

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

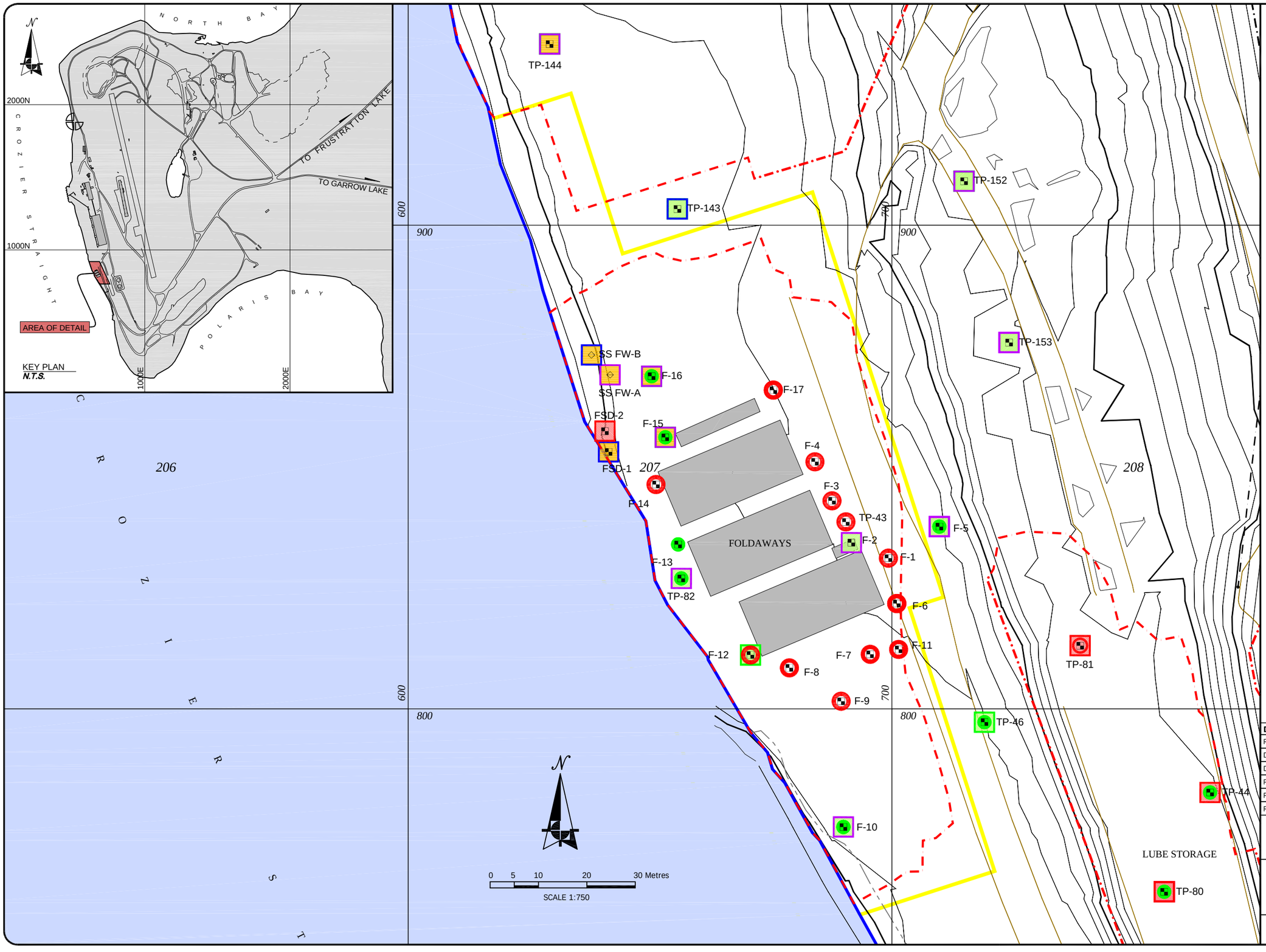
Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.



LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

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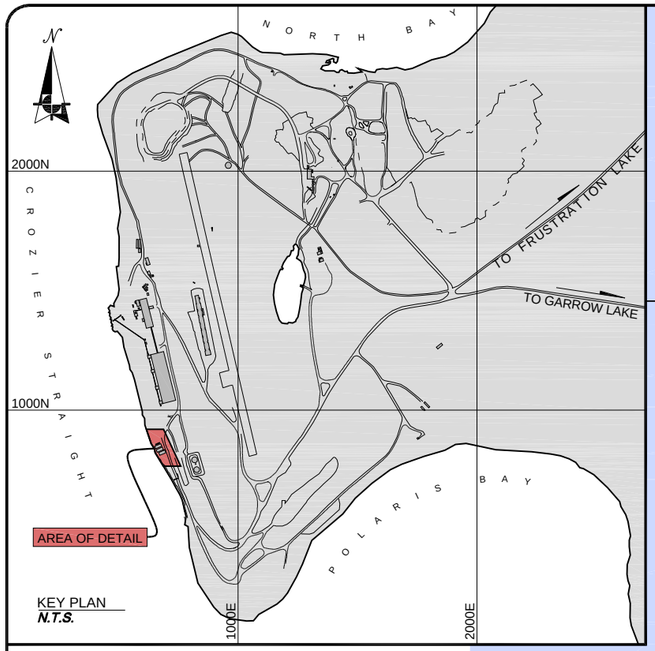
POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

FOLDAWAY BUILDINGS CONDITIONS BEFORE REMEDIATION

Gartner Lee

Figure No. **FA-07-1**



KEY PLAN
N.T.S.

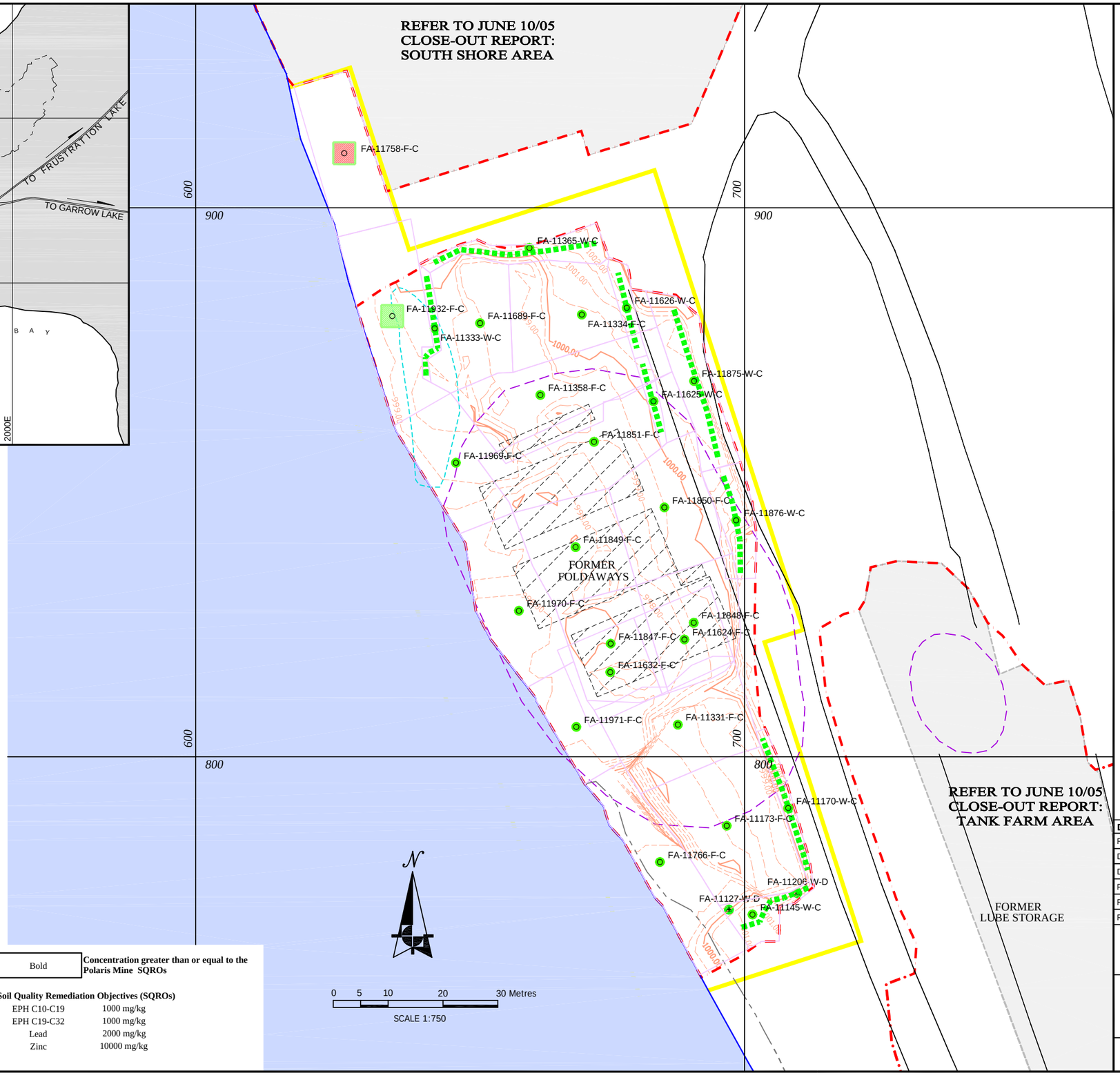
Confirmation Sample ID	EPH C10-C19 mg/kg	EPH C19-C32 mg/kg
FA-11127-W-D	<200	<200
FA-11145-W-C	330	<200
FA-11170-W-C	<200	<200
FA-11173-F-C	<200	<200
FA-11174-F-Q duplicate of FA-11173-F-C	<200	<200
FA-11206-W-D	270	<200
FA-11331-F-C	<200	<200
FA-11333-W-C	<200	550
FA-11371-W-Q duplicate of FA-11333-W-C	<200	320
FA-11334-F-C	290	300
FA-11358-F-C	820	800
FA-11365-W-C	<200	380
FA-11624-F-C	<200	<200
FA-11625-W-C	240	390
FA-11626-W-C	210	320
FA-11632-F-C	<200	280
FA-11689-F-C	<200	300
FA-11766-F-C	250	450
FA-11847-F-C	<200	340
FA-11745-F-Q duplicate of FA-11847-F-C	<200	440
FA-11848-F-C	<200	400
FA-11849-F-C	<200	360
FA-11850-F-C	<200	390
FA-11851-F-C	210	440
FA-11875-W-C	240	450
FA-11876-W-C	240	420
FA-11877-W-C	230	370
FA-11969-F-C	<200	<200
FA-11970-F-C	<200	<200
FA-11769-F-Q duplicate of FA-11970-F-C	<200	<200
FA-11971-F-C	230	430

Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
FA-11358-F-C	850	986
FA-11758-F-C	**2290**	5370
FA-11770-F-Q duplicate of FA-11758-F-C	<100	214
FA-11932-F-C	<100	50
FA-11969-F-C	<200	1480

Bold	**Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg



LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

ESP–7–I–D
- AREA
- SAMPLE ID
- TYPE: C= COMPOSITE SAMPLE (FLOOR–5 SAMPLES IN A 25x25m AREA; WALL–5 SAMPLES ALONG 25m OF WALL); D= DISCRETE SAMPLE; Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
- LOCATION: F= FLOOR SAMPLE; I= INTERMEDIATE FLOOR SAMPLE; W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

FOLDAWAY BUILDINGS CONDITIONS AFTER REMEDIATION

Gartner Lee

Figure No. **FA-07-2**

Appendix E

Tank Farm and Lube Oil Storage

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Tank Farm and Lube Oil Storage

BACKGROUND

The fuel tank farm and lube oil storage area were located to the south of the former concentrate storage shed (shown as Area 8 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*).

The fuel tank farm consisted of two above-ground steel tanks, each with a capacity of 5.5 million litres and one small tank with a capacity of 100,000 litres. The two large tanks had been used to store P20 and P60 diesel fuel. The small tank was originally used to store gasoline, but at the time of the decommissioning it contained the remains of the crude oil (from Bent Horn Island) used in a generator trial in the late 1980's. All tanks were located within a bermed area lined with an impermeable membrane.

The lube oil storage pad was located west of the tank farm. Hydraulic and lube oils used for stationary, mobile and power generation equipment were stored here. The solvent Varsol was also stored here. The oils and solvents were delivered in 205 litre drums, and the hydraulic and grease were stored in kegs or tubes. All of these items were stored on pallets. An incinerator was constructed at the south end of the pad during reclamation activities.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified hydrocarbon and metal contamination in the soil at the lube oil storage area. Nine (9) test pits were excavated during the ESA. The sample results indicated that elevated metal concentrations were present to at least 0.6 m below surface (maximum depth of test pits) on the north half of the lube oil storage pad. No elevated metal concentrations were detected on the south half of the pad. Hydrocarbon contamination was encountered in one test pit and it was limited to the upper 0.3 m. No samples were collected from within the fuel tank farm area during the ESA. The sample locations and an indication of results are shown on Figure TF-08-1: *Tank Farm Conditions Before Remediation.*

METHODOLOGY

Delineation

The preliminary area to be remediated, as identified in the ESA as an "Area of Concern", was further delineated for excavation through the collection and analysis of field screening samples from five (5) boreholes drilled in 2003 and eleven (11) boreholes drilled in 2004 The boreholes were advanced with an air rotary quarry drill. The boreholes were drilled to a depth of 3 m. A total of seventy (70) composite samples were collected from the drill returns that accumulated at the mouth of the boreholes. The composite samples were collected over 0.6 m to 0.75 m intervals. Following the collection of each sample the surface surrounding the borehole was cleared of the drill cuttings, before advancing the hole to collect the next sample.

The visual appearance and odour of the soil, along with field screening measurements obtained from the borehole samples were used to delineate the area to be excavated. The hydrocarbon field screening measurements were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. The samples were field screened for metals using the Niton X-ray fluorescence (XRF) elemental analyser.

The results from the drilling indicated a second area of hydrocarbon contamination at the south end of the pad to a depth of 3.0 m along with metal contamination.

There was no formal delineation attempted at the tank farm location. The lined berm was expected to be in good condition, thus creating a continuous barrier to the migration of hydrocarbon contamination.

Excavation

Excavation of the contaminated soils at the Lube Oil Storage area commenced on May 1, 2004 and it was completed on August 30, 2004. In the spring of 2004 the contaminated soil at the north end of the pad was drilled and blasted while the surface was frozen. The drilling and blasting program was guided by the field screening results from the boreholes drilled in 2003 and 2004. Following the blasting and removal of contaminated material the floor and walls of the excavation were sampled to determine where additional excavation was required to meet the Soil Quality Remediation Objectives (SQRO's). The excavator with a ripper attachment was used to expand the excavation further where required.

The contaminated soil at the south end of the Lube Oil Storage pad and at the Tank Farm was removed during July and August 2004, following the decommissioning of the incinerator building and fuel tanks. Contaminated soil here was ripped and loaded out into trucks with an excavator and the liner in the fuel tank farm removed. Gartner Lee Limited (GLL) was demobilized from site August 28, 2004 prior to the completion of the excavation activities and Teck Cominco Limited (TCL) directed the final two days of excavation of these areas.

The limits of the excavation are shown on Figure TF-08-2: *Tank Farm Area Conditions After Remediation*. The material excavated was disposed in the mine workings in accordance with regulatory approvals.

Confirmation Sampling

Upon receipt of field screening results that indicated that the material remaining in the excavation would meet the SQRO's, confirmation samples were collected in accordance with Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols. The floor of the excavated area was subdivided into individual composite sampling areas approximately 25 m by 25 m required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation. Composite samples were created by collecting four or five evenly spaced aliquots of soil within the individual composite sample area. A discrete sample is a single aliquot of soil from a specific point and these samples were collected randomly.

The soil samples were collected at the excavation limits and submitted to ALS Environmental (ALS) for analysis of Extractable Petroleum Hydrocarbons (EPH), metals and Polycyclic Aromatic Hydrocarbons (PAH). Additional excavation was undertaken in areas where the laboratory analytical results did not meet the SQRO's and additional confirmatory samples were taken upon completion of the excavation.

ANALYTICAL RESULTS

Analytical laboratory results for EPH, metals and PAH are summarized in Tables: TF-08-1, TF-08-2, and TF-08-3 along with the approved Polaris Mine SQRO's for petroleum hydrocarbons and metals. Twenty two (22) hydrocarbon and twenty two (22) metal remediation confirmation samples were submitted from the former Fuel Tank Farm and Lube Oil Storage area. The hydrocarbon samples were analyzed as follows: eleven (11) floor composite samples, eight (8) wall composite samples, and three (3) quality assurance quality control (QA/QC) samples. All hydrocarbon confirmatory samples were analyzed for EPH, and five (5) of these samples were also analyzed for PAH. The metal samples were analyzed for Lead and Zinc as follows: eight (8) floor composite samples, six (6) wall composite samples, four (4) discrete samples and four (4) quality assurance quality control (QA/QC) samples. Seven (7) randomly selected samples were analyzed for total metals. The soils quality results and the lateral limits of the excavation are shown on Figure TF-08-2.

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with the collection and analysis of soil included: the comparison of on-site field screening samples, the submission of blind duplicates to the analytical laboratory, and the analysis of analytical laboratory replicates. Relative percent differences (RpDs) for hydrocarbon concentrations of EPH C_{10}-C_{19} and EPH C_{19}-C_{32} have been calculated and compiled

in Table: TF-08-4 for three (3) analytical laboratory duplicates and one (1) analytical laboratory replicates. RpDs for concentrations of Lead and Zinc have been calculated and compiled in Table: TF-08-5 for four (4) field screening duplicates, four (4) laboratory duplicates and one (1) laboratory replicates. In total thirteen (13) QA/QC sample sets have been evaluated, including nine (9) remediation confirmation sample sets.

Eleven (11) of the sample results and their duplicate/replicate results either returned results below the practical quantitation limit, in which case the RpD value has been identified as "na" (not applicable) or they returned acceptable RpDs below the site specific objective of 50%. Two analytical laboratory duplicates returned results greater than the objective and therefore require further explanation and discussion.

The variance between Zinc concentration in sample TF-12196-W-C (7,210 mg/kg) and its blind duplicate, TF-12197-W-Q (12,000 mg/kg) and the Lead concentration in sample TF-12198-F-C (2,074 mg/kg) and its blind duplicate, TF-12190-F-Q (4,630 mg/kg) is considered indicative of the heterogeneity present at the Polaris Mine Site.

Polaris Mine Soil Quality Remediation Objectives

All of the twenty two (22) hydrocarbon remediation confirmation samples returned results below the Polaris Mines SQRO's for EPH.

Fourteen (14) of the twenty two (22) metals remediation confirmation samples returned results that met the Polaris Mine SQRO's for Lead (2000 mg/kg) and Zinc (10000 mg/kg). Five of the samples that returned results greater than the SQROs were part of QA/QC sample sets. One sample (TF-12190-F-Q) that returned results greater than the SQROs, included Lead concentrations greater than two times the SQRO, was part of a triplicate QA/QC sample set (including TF-12198-F-C and TF-12199-F-Q). One of the triplicate QA/QC samples, TF-12199-F-Q returned Lead concentrations (1616 mg/kg) that met the SQROs and the other triplicate QA/QC sample TF-12198-F-C returned Lead concentrations (2074 mg/kg) slightly above the SQRO for Lead. The average Lead concentration of the triplicate sample set was 2773 mg/kg. A second sample (TF-12197-W-Q) that returned Lead and Zinc concentrations greater than the SQROs was part of a duplicate sample set. Lead and Zinc results of the duplicate QA/QC sample (TF-12196-W-C) met the SQROs. Both duplicate QA/QC samples TF-12194-W-C and TF-12195-W-Q returned Lead concentrations greater than the SQROs. Two discrete samples (TF-10895-W-D, TF-12192-F-D) that returned Lead results greater than the SQRO were collected in composite sample areas that met the SQRO's.

The approved site-specific remedial objectives allow for minor exceedances in a small percentage of the confirmatory sample area, as long as the concentration is less than twice the remedial target. Since only a small percentage of the remedial area exceeds the SQROs for Lead and Zinc and given that the area with Lead concentrations greater than two times the remedial target was part of a triplicate QA/QC sample set with results that met the objectives for the former Tank

Farm and Lube Oil Storage area is therefore consider that the overall results for the site are in accordance with the site specific remedial objectives.

Discrete samples were collected to discern the homogeneity of the sample area represented by the composite samples. The tables below show a variability in the metal concentrations of the discrete samples versus the composite areas they represented as the composite samples represent the area as a whole and the discrete samples indicate the homogeneity of the given sample areas at the Polaris Mine.

Summary of Discrete Metals Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	Lead (mg/kg)	Zinc (mg/kg)	Discrete Sample ID	Lead (mg/kg)	Zinc (mg/kg)
TF-10959-F-C	600	3130	TF-10883-F-D	980	494
TF-10960-F-C	550	5770	TF-10889-F-D	1330	920
TF-10961-F-C	1780	6630	TF-10895-W-D	**2520**	9350
TF-12191-F-C	1530	7110	TF-12192-F-D	**2630**	7760

Generic Federal Soil Quality Guidelines for Parkland Land Use

The concentrations of Barium ranged from 245 mg/kg to 533 mg/kg in the seven remediation confirmation samples analysed for total metals. The generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guideline (CEQG) for Parkland land use for Barium in soil is 500 mg/kg. One of the samples exceeded this generic objective |(TF-10926-W-C). The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

Barium is a common mineral associated with lead sulphides, and it is found in cavities in limestone and dolostone. Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results*, are considered to be representative of background conditions. This sampling program included the collection of samples at the following intervals: surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of Barium greater than generic CCME CEQG for Parkland land use were detected in each interval. The variability of Barium concentrations in those samples is listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

In addition, the immobile nature of the Barium encountered on site was demonstrated in the ESA leachate test results that returned Barium concentrations at levels less than the detection limit of <3 mg/L and Barium was therefore not identified as a contaminant of concern in the ESA.

The concentrations of Cadmium ranged from 6.6 mg/kg to 29.4 mg/kg in the seven remediation confirmation samples from the Fuel Tank and Lube Oil Storage area analysed for total metals. Cadmium results for six samples (TF-10895-W-D, TF-10926-W-C, TF-10960-F-C, TF-12194-W-C, TF-12195-W-Q and TF-12190-F-Q) exceeded the CCME CEQG for Parkland land use of 10 mg/kg Cadmium in soil. Cadmium was not identified as a contaminant of concern based on the total metal analyses and leachate test results conducted during the ESA. Given the immobile nature of the Cadmium encountered on site, as demonstrated by the leachate results and the level of concentrations being less than twice the generic CCME CEQG for Parkland land use, no further remedial excavation work is considered necessary.

CONCLUSIONS

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the former Fuel Tank Farm and Lube Oil Storage area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Limited during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Brenda Bolton, B.A., B.Sc.
Environmental Geologist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

Alistair Kent, P.Eng.
Senior Reviewer

AL:BB:AK:gc

ATTACHMENTS

Tables

Table TF-08-1: Tank Farm Remediation Confirmation Soil Samples – Hydrocarbons
Table TF-08-2: Tank Farm Remediation Confirmation Soil Samples – Metals
Table TF-08-3: Tank Farm Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table TF-08-4: Tank Farm Quality Assurance and Quality Control Remediation Soil Samples – Hydrocarbons
Table TF-08-5: Tank Farm Quality Assurance and Quality Control Remediation Soil Samples – Metals

Figures

Figure TF-08-1: Tank Farm Conditions Before Remediation
Figure TF-08-2: Tank Farm Conditions After Remediation

Table TF-08-1. Tank Farm Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Tank Farm							
		Sample ID	TF-10494-F-C	TF-10495-F-C	TF-10663-F-C	TF-10826-W-C	TF-12168-F-C	TF-12178-F-Q	TF-12169-F-C	TF-12170-F-C
		Date Sampled	06-May-04	07-May-04	18-May-04	25-May-04	27-Aug-04	27-Aug-04	27-Aug-04	27-Aug-04
		ALS File Number	U3342	U3342	U3761	U3969r	U7584(1)	duplicate of	U7584(1)	U7584(1)
		Field Screen (ppm)[b]	-	-	-	70	10	TF-12168-F-C	10	10
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	240	290	260	230	320
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	470	450	440	550
LEPH[c]	1000	mg/kg	-	-	-	240	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	<200	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table TF-08-1. Tank Farm Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Tank Farm						
		Sample ID	TF-12171-F-C	TF-12172-F-C	TF-12173-F-C	TF-12174-F-C	TF-12175-W-C	TF-12176-W-C	TF-12177-W-C
		Date Sampled	27-Aug-04	27-Aug-04	27-Aug-04	27-Aug-04	27-Aug-04	27-Aug-04	27-Aug-04
		ALS File Number	U7584(1)	U7584(1)	U7584(1)	U7584(1)	U7584(1)	U7584(1)	U7584(1)
		Field Screen (ppm)[b]	10	15	15	15	15	-	15
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	320	320	300	280	300	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	550	540	490	490	510	220	250
LEPH[c]	1000	mg/kg	-	-	-	-	-	<200	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	220	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table TF-08-1. Tank Farm Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Tank Farm						
		Sample ID	TF-12187-F-C	TF-12188-W-C	TF-12189-W-C	TF-12194-W-C	TF-12195-W-Q	TF-12196-W-C	TF-12197-W-Q
		Date Sampled	29-Aug-04	29-Aug-04	29-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04
		ALS File Number	U7700	U7700	U7700	U7700	duplicate of	U7700(1)rr	duplicate of
		Field Screen (ppm)[b]	-	-	-	-	TF-12194-W-C	-	TF-12196-W-C
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	870	<200	930	<200	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	380	220	360	210	<200	240	<200
LEPH[c]	1000	mg/kg	-	-	-	-	<200	<200	<200
HEPH[c]	1000	mg/kg	-	-	-	-	<200	200	<200

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table TF-08-2. Tank Farm Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Tank Farm							
				Sample ID	TF-10494-F-C	TF-10495-F-C	TF-10663-F-C	TF-10826-W-C	TF-10883-F-D	TF-10889-F-D	TF-10895-W-D	TF-10926-W-C
				Date Sampled	06-May-04	07-May-04	18-May-04	25-May-04	27-May-04	27-May-04	28-May-04	28-May-04
				ALS File Number	U3342	U3342	U3761	U3969r	U4504	U4504	U4054	U4054
				Field Screen Pb (ppm)[b]	972	807	98	842	410	392	946	388
				Field Screen Zn (ppm)[b]	6704	4978	135	1327	445	1679	6447	2058
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH								8.28			7.98	8.88
Total Metals												.
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<20	-	-	<20	<20
Arsenic	T-As	-	12	mg/kg	-	-	-	<10	-	-	<10	<10
Barium	T-Ba	-	500	mg/kg	-	-	-	347	-	-	252	**533**
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1.0	-	-	<1.0	<1.0
Cadmium	T-Cd	-	10	mg/kg	-	-	-	6.6	-	-	**29.4**	**27**
Chromium	T-Cr	-	64	mg/kg	-	-	-	9.3	-	-	6.3	6.2
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	<4.0	-	-	<4.0	<4.0
Copper	T-Cu	-	63	mg/kg	-	-	-	15.4	-	-	6.6	11.1
Lead	T-Pb	2000	-	mg/kg	1380	<150	<100	460	980	1330	**2520**	510
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	<0.050	-	-	<0.050	<0.050
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8.0	-	-	<8.0	<8.0
Nickel	T-Ni	-	50	mg/kg	-	-	-	<10	-	-	<10	<10
Selenium	T-Se	-	1	mg/kg	-	-	-	<4.0	-	-	<4.0	<4.0
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4.0	-	-	<4.0	<4.0
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<10	-	-	<10	<10
Vanadium	T-V	-	130	mg/kg	-	-	-	22.2	-	-	21.8	27.1
Zinc	T-Zn	10000	-	mg/kg	6170	84	212	2620	494	920	9350	3310

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TF-08-2. Tank Farm Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Tank Farm							
				Sample ID	TF-10959-F-C	TF-10960-F-C	TF-10961-W-C	TF-11302-F-C	TF-12191-F-C	TF-12192-F-D	TF-12193-W-C	TF-12194-W-C
				Date Sampled	27-May-04	27-May-04	27-May-04	31-May-04	30-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04
				ALS File Number	U4054	U4054	U4054	U4137	U7700	U7700	U7700	U7700
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	254	881	969	-	-	1563	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	1994	6649	6773	-	-	4944	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH						8.99						8.40
Total Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	-	-	-	-	-	<20
Arsenic	T-As	-	12	mg/kg	-	<10	-	-	-	-	-	<10
Barium	T-Ba	-	500	mg/kg	-	317	-	-	-	-	-	251
Beryllium	T-Be	-	4[d]	mg/kg	-	<1.0	-	-	-	-	-	<1.0
Cadmium	T-Cd	-	10	mg/kg	-	**19**	-	-	-	-	-	**28.1**
Chromium	T-Cr	-	64	mg/kg	-	4.6	-	-	-	-	-	7.1
Cobalt	T-Co	-	50[d]	mg/kg	-	<4.0	-	-	-	-	-	<4.0
Copper	T-Cu	-	63	mg/kg	-	5.8	-	-	-	-	-	11.3
Lead	T-Pb	2000	-	mg/kg	600	550	1780	1440	1530	**2630**	**2000**	**2360**
Mercury	T-Hg	-	6.6	mg/kg	-	<0.050	-	-	-	-	-	<0.050
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8.0	-	-	-	-	-	<8.0
Nickel	T-Ni	-	50	mg/kg	-	<10	-	-	-	-	-	14
Selenium	T-Se	-	1	mg/kg	-	<4.0	-	-	-	-	-	<10.0
Silver	T-Ag	-	20[d]	mg/kg	-	<4.0	-	-	-	-	-	<4.0
Tin	T-Sn	-	50[d]	mg/kg	-	<10	-	-	-	-	-	<10
Vanadium	T-V	-	130	mg/kg	-	25.5	-	-	-	-	-	27.5
Zinc	T-Zn	10000	-	mg/kg	3130	5770	6630	5280	7110	7760	8580	8230

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TF-08-2. Tank Farm Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Tank Farm					
				Sample ID	TF-12195-W-Q	TF-12196-W-C	TF-12197-W-Q	TF-12198-F-C	TF-12190-F-Q	TF-12199-F-Q
				Date Sampled	30-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04
				ALS File Number	U7700	U7700	U7700	U7700	U7700	U7700
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	duplicate of	-	duplicate of	-	duplicate of	duplicate of
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	TF-12194-W-C	-	TF-12196-W-C	-	TF-12198-F-C	TF-12198-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH					8.46				8.42	
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	<20	-	-	-	<20	-
Arsenic	T-As	-	12	mg/kg	<10	-	-	-	<10	-
Barium	T-Ba	-	500	mg/kg	249	-	-	-	245	-
Beryllium	T-Be	-	4[d]	mg/kg	<1.0	-	-	-	<1.0	-
Cadmium	T-Cd	-	10	mg/kg	**28.5**	-	-	-	**26.8**	-
Chromium	T-Cr	-	64	mg/kg	6.3	-	-	-	6.6	-
Cobalt	T-Co	-	50[d]	mg/kg	<4.0	-	-	-	<4.0	-
Copper	T-Cu	-	63	mg/kg	13.6	-	-	-	10.6	-
Lead	T-Pb	2000	-	mg/kg	**2680**	1490	**2020**	**2074**	**4630**	1616
Mercury	T-Hg	-	6.6	mg/kg	<0.050	-	-	-	<0.050	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<8.0	-	-	-	<8.0	-
Nickel	T-Ni	-	50	mg/kg	13	-	-	-	14	-
Selenium	T-Se	-	1	mg/kg	<5.0	-	-	-	<4.0	-
Silver	T-Ag	-	20[d]	mg/kg	<4.0	-	-	-	<4.0	-
Tin	T-Sn	-	50[d]	mg/kg	<10	-	-	-	<10	-
Vanadium	T-V	-	130	mg/kg	28.6	-	-	-	28.2	-
Zinc	T-Zn	10000	-	mg/kg	8190	7210	**12000**	7807	7820	5690

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TF-08-3. Tank Farm Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location Sample ID	Tank Farm				
		Date Sampled	TF-10826-W-C	TF-12176-W-C	TF-12195-W-C	TF-12196-W-C	TF-12197-W-Q
		ALS File Number	25-May-04	27-Aug-04	30-Aug-04	30-Aug-04	30-Aug-04
		Field Screen (ppm)[b]	U3969r	U7584(1)	U7700	U7700	duplicate of
			70	-	-	-	TF-12196-W-C
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**				
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	-	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	5[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TF-08-4. Tank Farm Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee				Location	Tank Farm			
				Sample ID	TF-12168-F-C	TF-12194-W-C	TF-12196-W-C	TF-12171-F-C
				Duplicate ID	TF-12178-F-Q	TF-12195-W-Q	TF-12197-W-Q	QC# 403990
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**			
Analytical Laboratory Duplicates								
EPH C_{10}-C_{19}								
Sample Result	mg/kg	200	1000		290	<200	<200	-
Duplicate Result	mg/kg	200	1000		260	<200	<200	-
RpD	**%**				na	na	na	
EPH C_{19}-C_{32}								
Sample Result	mg/kg	200	1000		470	210	<200	-
Duplicate Result	mg/kg	200	1000		450	240	<200	-
RpD	**%**				na	na	na	
Analytical Laboratory Replicates								
EPH C_{10}-C_{19}								
Sample Result	mg/kg	200	1000		-	-	-	320
Duplicate Result	mg/kg	200	1000		-	-	-	330
RpD	**%**							na
EPH C_{19}-C_{32}								
Sample Result	mg/kg	200	1000		-	-	-	550
Duplicate Result	mg/kg	200	1000		-	-	-	550
RpD	**%**							na

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table TF-08-5. Tank Farm Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee	Location			Tank Farm								
	Sample ID			TF-10883-F-D	TF-12129-W-D	TF-12130-W-D	TF-12131-W-D	TF-12132-W-D	TF-12194-W-C	TF-12196-W-C	TF-12198-F-C	TF-12198-F-C
	Duplicate ID			U4054r	TF-12353-W-Q	TF-12354-W-Q	TF-12355-W-Q	TF-12356-W-Q	TF-12195-W-Q	TF-12197-W-Q	TF-12190-F-Q	TF-12199-F-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**								
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350	-	2851	739	2510	8314	-	-	-	-
Duplicate Result	mg/kg	70	350	-	2323	834	1945	8458	-	-	-	-
RpD	%				20%	12%	25%	2%				
Zinc (Zn)										-	-	-
Sample Result	mg/kg	150	750	-	18429	5421	10978	44636	-	-	-	-
Duplicate Result	mg/kg	150	750	-	16974	8908	10250	46915	-	-	-	-
RpD	%				8%	49%	7%	5%				
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	-	-	-	-	-	2360	1490	2074	2074
Duplicate Result	mg/kg	100	500	-	-	-	-	-	2680	2020	4630	1616
RpD	%								13%	30%	**76%**	25%
Zinc (Zn)												
Sample Result	mg/kg	3	15	-	-	-	-	-	8230	7210	7807	7807
Duplicate Result	mg/kg	3	15	-	-	-	-	-	8190	12000	7820	5690
RpD	%								0%	**50%**	0%	31%
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	980	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500	400	-	-	-	-	-	-	-	-
RpD	%			na								
Zinc (Zn)												
Sample Result	mg/kg	3	15	494	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15	342	-	-	-	-	-	-	-	-
RpD	%			36%								

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

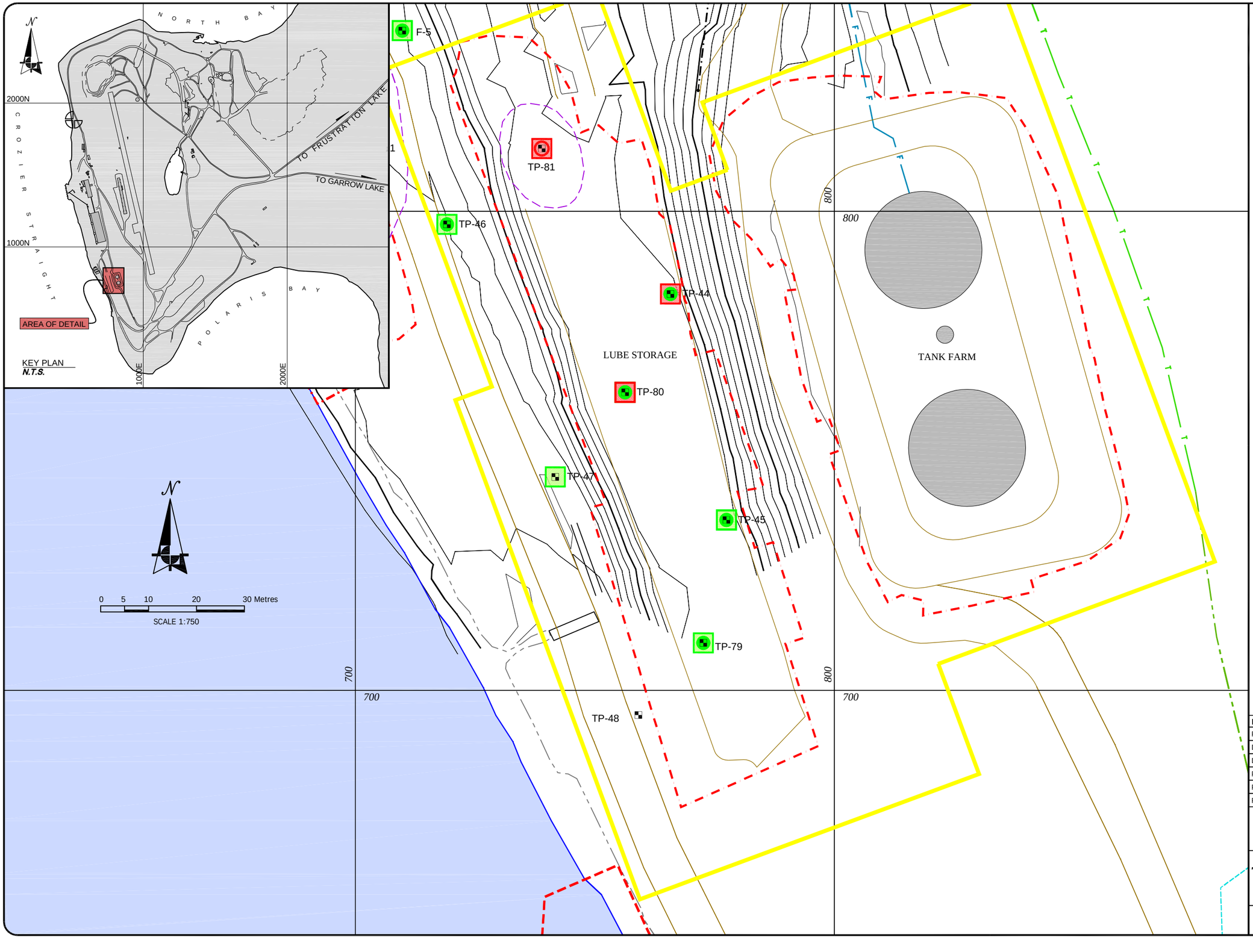
na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

KEY PLAN
N.T.S.



LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

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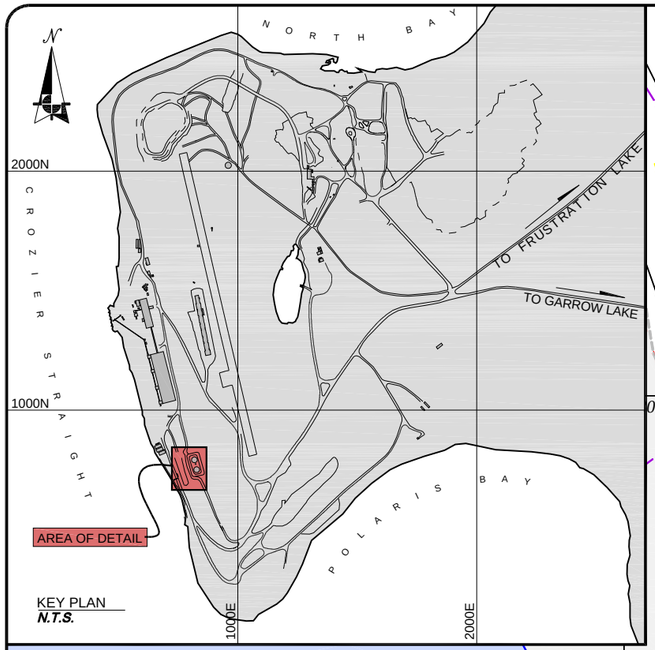
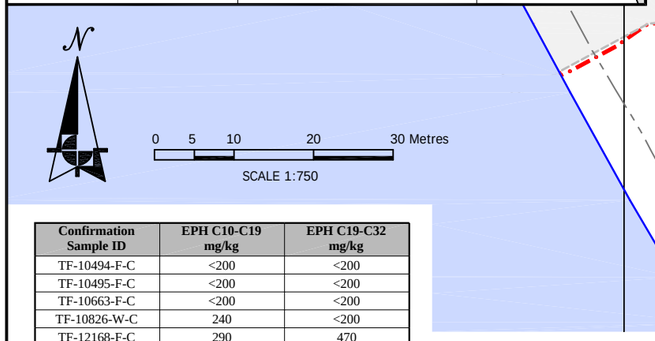
POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

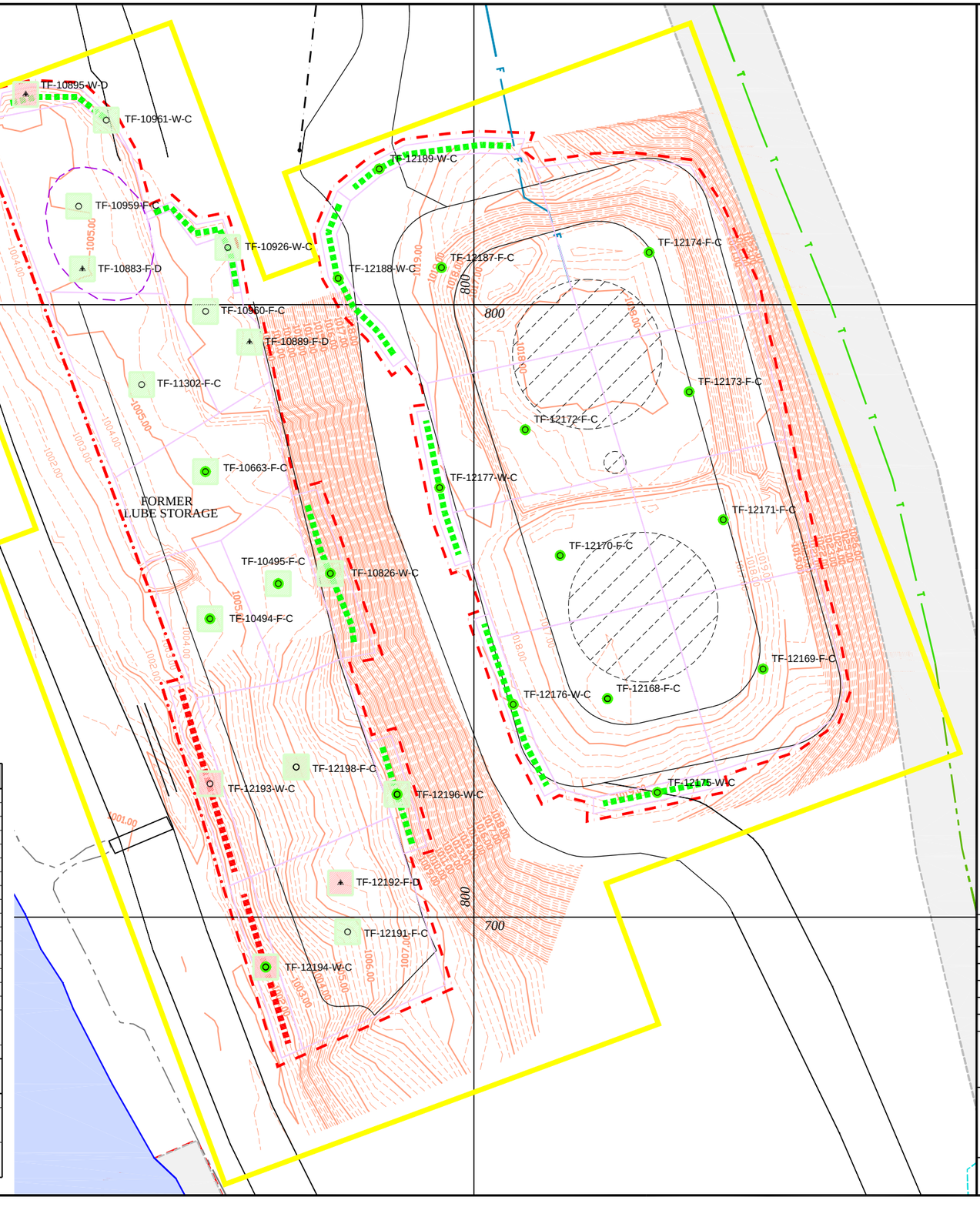
TANK FARM CONDITIONS BEFORE REMEDIATION

Gartner Lee

Figure No.
TF-08-1







Confirmation Sample ID	EPH C10-C19 mg/kg	EPH C19-C32 mg/kg
TF-10494-F-C	<200	<200
TF-10495-F-C	<200	<200
TF-10663-F-C	<200	<200
TF-10826-W-C	240	<200
TF-12168-F-C	290	470
TF-12178-F-Q duplicate of TF-12168-F-C	260	450
TF-12169-F-C	230	440
TF-12170-F-C	320	550
TF-12171-F-C	320	550
TF-12172-F-C	320	540
TF-12173-F-C	300	490
TF-12174-F-C	280	490
TF-12175-W-C	300	510
TF-12176-W-C	<200	220
TF-12177-W-C	<200	250
TF-12187-F-C	870	380
TF-12188-W-C	<200	220
TF-12189-W-C	930	360
TF-12194-W-C	<200	210
TF-12195-W-Q duplicate of TF-12194-W-C	<200	<200
TF-12196-W-C	<200	240
TF-12197-W-Q duplicate of TF-12196-W-C	<200	<200

Bold	**Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg

Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
TF-10494-F-C	1380	6170
TF-10495-F-C	<150	84
TF-10663-F-C	<100	212
TF-10826-W-C	460	2620
TF-10883-F-D	980	494
TF-10889-F-D	1330	920
TF-10895-W-D	**2520**	9350
TF-10926-W-C	510	3310
TF-10959-F-C	600	3130
TF-10960-F-C	550	5770
TF-10961-W-C	1780	6630
TF-11302-F-C	1440	5280
TF-12191-F-C	1530	7110
TF-12192-F-D	**2630**	7760
TF-12193-W-C	**2000**	8580
TF-12194-W-C	**2360**	8230
TF-12195-W-Q duplicate of TF-12194-W-C	**2680**	8190
TF-12196-W-C	1490	7210
TF-12197-W-Q dupliate of TF-12196-W-C	**2020**	**12000**
TF-12198-F-C	**2074**	7807
TF-12190-F-Q duplicate of TF-12198-F-C	**4630**	7820
TF-12199-F-Q duplicate of TF-12198-F-C	1616	5690

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

ESP–7–I–D
- AREA
- SAMPLE ID
- TYPE: C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA WALL–5 SAMPLES ALONG 25m OF WALL; D= DISCRETE SAMPLE; Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
- LOCATION: F= FLOOR SAMPLE; I= INTERMEDIATE FLOOR SAMPLE; W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- *EPH – EXTRACTABLE PETROLEUM HYDROCARBONS
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

DRAWING INFORMATION:

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

TANK FARM CONDITIONS AFTER REMEDIATION

Gartner Lee

Figure No. **TF-08-2**

Appendix F

Tailings Pipeline

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Tailings Pipeline

BACKGROUND

The tailings pipeline corridor (shown as Area 10 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan , December 31, 2004*) was located between the process barge and Garrow Lake. Two pipe lines, approximately 4 km long, were installed from the process barge to a tailings thickener. One line was used to carry tailings from the concentrator in the process barge to the thickener, and the other line return recycled water from the thickener to the process barge. The tailings thickener had three discharge lines between it and Garrow Lake. Two lines discharging from the tailings thickener carried the thickened tails to Garrow Lake, approximately 1 km to the east. A third pipe line discharging from the tailings thickener was approximately 100 m long and it lead to the emergency tailings impoundment. The impoundment was remediated in 2003 and reported on in Appendix D *23305–Polaris Mine Operations Contaminated Soil Remediation Close Out Report: Tailings Thickener Area* of the February 16, 2004 Report *23305–Contaminated Soil Remediation 2003 Close Out Reports, Polaris Mine, Nunavut.*

Incidents of tailing spills along the pipeline corridor were documented as part of the Environmental Site Assessment (ESA) conducted in 1999 and 2000. Between January 1982 and May 1999 there were eleven tailings spills along the corridor. In all cases the spills were reported to Department of Indian and Northern Development (DIAND) Water Resources. Spill clean up was carried out by mine operations immediately after each incident. In cases where spills occurred in winter, further clean up was carried out when the surface thawed the following summer. The spilt tailings and contaminated soils and gravels were disposed into the underground workings. No environmental sampling was conducted during operations to evaluate the effectiveness of the clean up activities.

Five areas along the tailings pipeline were identified in the ESA as areas impacted by spilt tailings due to the eleven breaks in the tailings pipeline. These five areas included:

1. an area between the concentrate storage shed and the process barge;
2. an area between the concentrate storage shed and the fuel tank farm;
3. an area just south of the fuel tank farm;
4. an area immediately southwest of the road to the detonator magazine; and
5. an area adjacent the tailings thickener building, that was remediated in 2003.

One soil sample collected during the ESA in the area between concentrate storage shed and the process barge (listed as the first area above) returned lead and zinc concentrations greater than the Polaris Mine Soil Quality Remediation Objectives (SQROs). Twelve additional soil samples were collected along the tailings pipeline corridor during the ESA and all twelve sample results met the SQROs for lead and zinc. However, no samples were collected from the spill area just south of the fuel tank farm (listed as the third area above). Figure TL-10-1: *Tailings Pipeline Conditions Before Remediation,* shows the approximate locations of the tailings pipeline breaks and results of the soil samples collected during the ESA investigations. Each of the five areas identified as being impacted by the eleven tailings spills was identified as an area of concern for metals in the ESA.

Two of the eleven spills occurred due to breaks in the tailings pipeline adjacent to the tailings thickener building (listed as the fifth area above) and this area was remediated in 2003 as documented in Appendix D *23305 – Polaris Mine Operations Contaminated Soil Remediation Close Out Report: Tailings Thickener Area* of the February 16, 2004 Report: *23305 – Contaminated Soil Remediation 2003 Close Out Reports, Polaris Mine, Nunavut*.

METHODOLOGY

Delineation

The preliminary boundaries of the areas of concern for metal contamination, as identified in the ESA, was further delineated by inspecting the entire length of the footprint of the tailings pipeline for visual evidence of fine grained sand or silt that would indicate remnant spilt tailings and then collecting soil samples at these locations. Field screening samples were collected from 0 cm to 5 cm, and 5 cm to 10 cm depths on July 3, 4 and 5, 2003 in accordance with standard Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols. The samples were analyzed on site using a portable Niton X-ray fluorescence (XRF) elemental analyzer. Based on the results of the field screening sampling, GLL collected confirmatory results from those areas indicated as not requiring remediation and modified the boundaries of the

areas to be remediated and directed excavation. Field screening results from the area impacted by a tailings line break immediately southwest of the road to the detonator magazine (listed as the fourth area above) indicated that the soil met the SQROs for lead and zinc. The field screening results also indicated that where metals contamination was present it was restricted to the surface, within the upper 5 cm.

Excavation

Excavation of the areas along the tailings pipeline occurred intermittently throughout 2003 and 2004. The excavation was limited to the surface and was undertaken with an excavator in more extensive areas, and with a hand shovel in smaller areas. When machinery was used for the excavation, soil within the excavation boundaries was loaded out into trucks with an excavator. When a hand shovel was used, the soil was deposited into sacks that were then loaded onto the back of an All-terrain vehicle (ATV) and stockpiled in areas readily accessible to an excavator.

Soil samples were collected from the base of the excavated areas and field screened using the Niton XRF elemental analyzer. Upon receipt of field screening results that indicated the SQROs would be met the excavation limits were surveyed.

The final limits of the excavation areas are shown on Figure TL-10-02: *Tailings Pipeline Conditions After Remediation*. The material excavated was disposed in the mine workings in accordance with regulatory approvals.

Confirmation Sampling

Soil samples were collected within the excavation limits and submitted to ALS Environmental of Vancouver, BC, for metals analysis to verify the concentration of metals. Additional excavation was undertaken in areas that did not meet the SQROs for lead and or zinc and additional confirmatory samples were taken upon completion of the excavation. Composite samples were collected over a length of 25 m along the footprint of the tailings line.

Confirmation soil samples were also collected from the area immediately southwest of the road to the detonator magazine (listed as the fourth area above) and submitted to ALS Environmental. Based on the laboratory results, no remedial excavation was required in this area.

ANALYTICAL RESULTS

Analytical laboratory confirmatory results for total metals are summarized in Tables TL-10-01, along with the approved Polaris Mine SQROs for metals. A total of twenty four (24) remediation

confirmation soil samples were submitted from the footprint of the former tailings pipeline as follows: sixteen (16) composite floor samples, five (5) discrete floor, and three (3) quality assurance/ quality control (QA/QC) duplicate samples. The soil quality results and the lateral limits of the excavations are shown on Figure TL-10-2.

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with collecting and analyzing soil were implemented during the remediation of the tailings pipeline corridor, including the comparison of on-site field screening samples, the submission of blind duplicates to the analytical laboratory, and the analysis of analytical replicates. Relative percent differences (RpD) have been calculated and compiled in Table TL-10-02 for twenty (20) on-site field screened duplicates, three (3) analytical laboratory duplicates, three (3) analytical laboratory replicates for a total of twenty six (26) QA/QC sample sets for lead and zinc concentrations.

All twenty (20) on-site field screened sample results and their duplicate results either returned results below the practical quantitation limit, in which case the RpD value has been identified as "na" (not applicable) or they returned acceptable RpDs below the site specific objective of 50%. . The three analytical laboratory duplicates and one of the analytical replicates returned RpDs greater than the objective, 50% for either lead or zinc.

The variance between the sample and its duplicate or replicate is indicative of sample heterogeneity due to the presence of trace amounts of concentrate dust in the sample. Therefore, the metal QA/QC samples from the tailings pipeline area serve to document the variable nature of the metal concentrations in the soil.

Discussion

All confirmatory soil sample results from the former tailings pipeline corridor meet the SQROs for lead and zinc. Four soil samples were analyzed for addition metals. Arsenic concentrations ranged from <10 mg/kg to 13 mg/kg and barium concentrations ranged from 452 mg/kg to 776 mg/kg. The generic Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Parkland land use is 12 mg/kg arsenic and 500 mg/kg barium in soil. The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results,* are considered to be representative of background conditions. Samples were collected at the following intervals surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of arsenic and barium

greater than generic CCME CEQG Parkland land use were detected in each interval. The variability of arsenic and barium concentrations in those samples in listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Arsenic and Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Arsenic	12	<5	15.1	12	11 +/- 2.7	13	12.25
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The concentrations of arsenic and barium remaining along the tailings pipeline corridor after remediation is within the range for the background area. The presence of arsenic and barium concentrations in soil above the generic CCME guidelines for Parkland land use is therefore attributed to natural background mineralogy. In addition, the immobile nature of the arsenic and barium encountered on site was also demonstrated in the 1999 ESA leachate analysis that returned arsenic and barium concentrations at levels less than the detection limit and they were therefore not identified as a contaminants of concern in the Polaris Mine ESA.

CONCLUSIONS

Based on confirmatory sampling, consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the former tailings pipeline corridor has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at

specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Brenda Bolton, B.A., B.Sc.
Environmental Geologist.

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

AL:BB:gc

ATTACHMENTS

Tables

Table TL-10-1: Tailings Pipeline Remediation Confirmation Soil Samples – Metals
Table TL-10-2: Tailings Pipeline Quality Assurance and Quality Control Remediation Soil Samples – Metals

Figures

Figure TL-10-1: Tailings Pipeline Conditions Before Remediation
Figure TL-10-2: Tailings Pipeline Conditions After Remediation

Table TL-10-1. Tailings Pipeline Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Tailings Pipeline							
				Sample ID	TL-21-1	TL-24-1	TL-12092-F-C	TL-12093-F-C	TL-12094-F-C	TL-12095-F-C	TL-12096-F-C	TL-12097-F-Q
				Date Sampled	11-Jul-03	11-Jul-03	1-Aug-04	1-Aug-04	1-Aug-04	1-Aug-04	1-Aug-04	1-Aug-04
				ALS File Number	T1536	T1536	U6826rr	U6826rr	U6826rr	U6826rr	U6826rr	U6826rr
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	725	453	112	448	160	394	192	duplicate of
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	2840	1590	523	1637	722	2551	556	TL-12096-F-C
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH							-					
Metals												
Antimony	T-Sb	-	20[d]	mg/kg			<20					
Arsenic	T-As	-	12	mg/kg			<10					
Barium	T-Ba	-	500	mg/kg			452					
Beryllium	T-Be	-	4[d]	mg/kg			<1					
Cadmium	T-Cd	-	10	mg/kg			<1					
Chromium	T-Cr	-	64	mg/kg			7					
Cobalt	T-Co	-	50[d]	mg/kg			<4.0					
Copper	T-Cu	-	63	mg/kg			9					
Lead	T-Pb	2000	-	mg/kg	1600	525	<100	370	120	450	130	240
Mercury	T-Hg	-	7	mg/kg			-					
Molybdenum	T-Mo	-	10[d]	mg/kg			<8					
Nickel	T-Ni	-	50	mg/kg			13					
Selenium	T-Se	-	1	mg/kg			<6					
Silver	T-Ag	-	20[d]	mg/kg			<4					
Tin	T-Sn	-	50[d]	mg/kg			<10					
Vanadium	T-V	-	130	mg/kg			30					
Zinc	T-Zn	10000	-	mg/kg	5410	2110	348	1310	565	3090	369	952

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TL-10-1. Tailings Pipeline Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Tailings Pipeline							
				Sample ID	TL-12098-F-C	TL-12099-F-C	TL-12100-F-C	TL-12101-F-C	TL-12102-F-C	TL-12103-F-D	TL-12118-F-C	TL-12119-F-D
				Date Sampled	1-Aug-04	1-Aug-04	1-Aug-04	1-Aug-04	1-Aug-04	1-Aug-04	4-Aug-04	4-Aug-04
				ALS File Number	U6826rr	U6826rr	U6826rr	U6826rr	U6826rr	U6826rr	U6770(1)	U6770(1)
				Field Screen Pb (ppm)[b]	750	545	322	356	570	312	207	96
				Field Screen Zn (ppm)[b]	2695	1572	970	680	945	946	740	220
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH												
Metals												
Antimony	T-Sb	-	20[d]	mg/kg				<20		<20		
Arsenic	T-As	-	12	mg/kg				<10		<10		
Barium	T-Ba	-	500	mg/kg				**707**		**594**		
Beryllium	T-Be	-	4[d]	mg/kg				<1		<1		
Cadmium	T-Cd	-	10	mg/kg				2.1		2.1		
Chromium	T-Cr	-	64	mg/kg				8		14		
Cobalt	T-Co	-	50[d]	mg/kg				<4		<4		
Copper	T-Cu	-	63	mg/kg				13		12		
Lead	T-Pb	2000	-	mg/kg	850	640	350	590	530	300	200	<100
Mercury	T-Hg	-	7	mg/kg				-		-		
Molybdenum	T-Mo	-	10[d]	mg/kg				<8		<8		
Nickel	T-Ni	-	50	mg/kg				12		15		
Selenium	T-Se	-	1	mg/kg				<6		<8		
Silver	T-Ag	-	20[d]	mg/kg				<4		<4		
Tin	T-Sn	-	50[d]	mg/kg				<10		<10		
Vanadium	T-V	-	130	mg/kg				47		40		
Zinc	T-Zn	10000	-	mg/kg	2430	1510	916	459	756	744	515	120

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TL-10-1. Tailings Pipeline Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Tailings Pipeline					
				Sample ID	TL-12120-F-C	TL-12121-F-C	TL-12122-F-C	TL-12127-F-D	TL-12134-F-C	TL-12162-F-C
				Date Sampled	4-Aug-04	4-Aug-04	4-Aug-04	5-Aug-04	5-Aug-04	18-Aug-04
				ALS File Number	U6770(1)	U6770(1)	U6770(1)	U6770	U6770	U7328
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	149	304	337	99	-	160
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	409	788	879	202	-	475
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**					
pH								8.3		
Metals										
Antimony	T-Sb	-	20[d]	mg/kg				<20		
Arsenic	T-As	-	12	mg/kg				**13**		
Barium	T-Ba	-	500	mg/kg				**776**		
Beryllium	T-Be	-	4[d]	mg/kg				<1		
Cadmium	T-Cd	-	10	mg/kg				<1		
Chromium	T-Cr	-	64	mg/kg				13		
Cobalt	T-Co	-	50[d]	mg/kg				10		
Copper	T-Cu	-	63	mg/kg				39		
Lead	T-Pb	2000	-	mg/kg	<100	380	180	<100	<100	<100
Mercury	T-Hg	-	7	mg/kg				0.11		
Molybdenum	T-Mo	-	10[d]	mg/kg				<8		
Nickel	T-Ni	-	50	mg/kg				42		
Selenium	T-Se	-	1	mg/kg				<20		
Silver	T-Ag	-	20[d]	mg/kg				<4		
Tin	T-Sn	-	50[d]	mg/kg				<10		
Vanadium	T-V	-	130	mg/kg				92		
Zinc	T-Zn	10000	-	mg/kg	308	637	1120	106	90	58

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table TL-10-2. Tailings Pipeline Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee			Location	Tailings Pipeline								
			Sample ID	TL-31-1-D	TL-47-1-D	TL-54-2-D	TL-12095-F-C	TL-12096-F-C	TL-12100-F-C	TL-12113-F-C	TL-12114-F-C	TL-12114-F-C
			Duplicate ID	TL-31-1-Q	TL-47-1-Q	TL-54-2-Q	QC# 400695	TL-12097-F-Q	QC# 400696	TL-12337-F-Q	TL-12133-F-Q	TL-12338-F-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**								
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350	1340	1220	337	-	192	-	1059	-	1297
Duplicate Result	mg/kg	70	350	1280	1280	248	-	261	-	1124	-	1276
RpD	**%**			5	5	na	-	na	-	6	-	2
Zinc (Zn)												
Sample Result	mg/kg	150	750	7597	3888	868	-	557	-	1741	-	1635
Duplicate Result	mg/kg	150	750	7507	4288	885	-	933	-	1740	-	1610
RpD	**%**			1	10	2	-	na	-	0	-	2
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	-	-	-	-	130	-	-	8650	8650
Duplicate Result	mg/kg	100	500	-	-	-	-	240	-	-	4520	<100
RpD	**%**			-	-	-	-	na	-	-	**63**	na
Zinc (Zn)												
Sample Result	mg/kg	2	10	-	-	-	-	369	-	-	1890	1890
Duplicate Result	mg/kg	2	10	-	-	-	-	952	-	-	1450	185
RpD	**%**			-	-	-	-	**88**	-	-	26	**165**
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	-	-	-	450	-	350	-	-	
Duplicate Result	mg/kg	100	500	-	-	-	370	-	380	-	-	
RpD	**%**			-	-	-	na	-	na	-	-	
Zinc (Zn)												
Sample Result	mg/kg	2	10	-	-	-	3090	-	916	-	-	
Duplicate Result	mg/kg	2	10	-	-	-	2080	-	1010	-	-	
RpD	**%**			-	-	-	39	-	10	-	-	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table TL-10-2. Tailings Pipeline Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Tailings Pipeline								
				Sample ID	TL-12115-F-C	TL-12116-F-C	TL-12117-F-C	TL-12118-F-C	TL-12119-F-D	TL-12120-F-C	TL-12121-F-C	TL-12122-F-C	TL-12123-F-C
				Duplicate ID	TL-12339-F-Q	TL-12340-F-Q	TL-12341-F-Q	TL-12342-F-Q	TL-12343-F-Q	TL-12344-F-Q	TL-12345-F-Q	TL-12346-F-Q	TL-12347-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		935	764	255	208	97	150	305	338	76
Duplicate Result	mg/kg	70	350		1047	662	254	194	88	131	269	252	90
RpD	**%**				11	14	na	na	na	na	na	na	na
Zinc (Zn)													
Sample Result	mg/kg	150	750		2581	2238	812	740	220	409	788	879	149
Duplicate Result	mg/kg	150	750		2510	2439	720	681	265	420	841	848	220
RpD	**%**				3	9	na	na	na	na	7	4	na
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	**%**				-	-	-	-	-	-	-	-	-
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	**%**				-	-	-	-	-	-	-	-	-
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	**%**				-	-	-	-	-	-	-	-	-
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	**%**				-	-	-	-	-	-	-	-	-

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table TL-10-2. Tailings Pipeline Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Tailings Pipeline					
				Sample ID	TL-12124-F-C	TL-12125-F-C	TL-12126-F-C	TL-12127-F-D	TL-12133-F-Q	TL-12162-F-C
				Duplicate ID	TL-12348-F-Q	TL-12349-F-Q	TL-12350-F-Q	TL-12351-F-Q	QC# 400261	TL-12377-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**					
On Site Field Screening Duplicates										
Lead (Pb)										
Sample Result	mg/kg	70	350		79	91	93	99	-	160
Duplicate Result	mg/kg	70	350		88	96	79	95	-	104
RpD	**%**				na	na	na	na	-	na
Zinc (Zn)										
Sample Result	mg/kg	150	750		145	198	151	202	-	475
Duplicate Result	mg/kg	150	750		223	225	185	59	-	203
RpD	**%**				na	na	na	na	-	na
Analytical Laboratory Duplicates										
Lead (Pb)										
Sample Result	mg/kg	100	500		-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-
RpD	**%**				-	-	-	-	-	-
Zinc (Zn)										
Sample Result	mg/kg	2	10		-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-
RpD	**%**				-	-	-	-	-	-
Analytical Laboratory Replicates										
Lead (Pb)										
Sample Result	mg/kg	100	500		-	-	-	-	4520	-
Duplicate Result	mg/kg	100	500		-	-	-	-	2340	-
RpD	**%**				-	-	-	-	**64**	-
Zinc (Zn)										
Sample Result	mg/kg	2	10		-	-	-	-	1450	-
Duplicate Result	mg/kg	2	10		-	-	-	-	1010	-
RpD	**%**				-	-	-	-	36	-

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

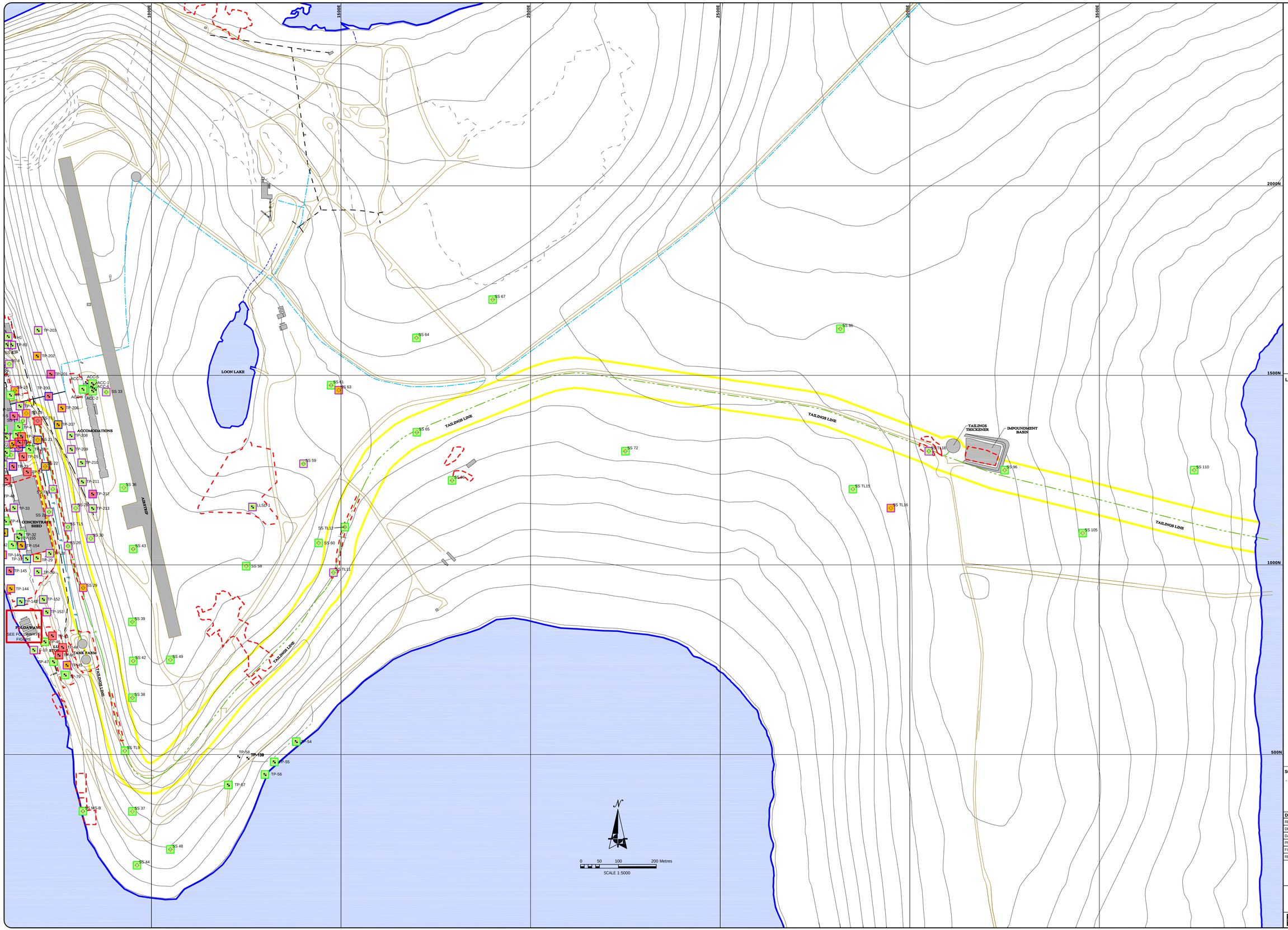
Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*



LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

* EPH DATA FROM THE 1999/2000 ESA IS NOT ILLUSTRATED ON THIS FIGURE AS HYDROCARBONS ARE NOT A CONCERN ASSOCIATED DIRECTLY WITH THE TAILINGS PIPELINE. ANY AREAS CO–CONTAMINATED WITH METALS AND HYDROCARBONS ARE ADDRESSED IN SEPARATE CLOSE–OUT REPORTS.

SOURCE OF DRAWING:

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

TAILINGS PIPELINE CONDITIONS BEFORE REMEDIATION

Gartner Lee

FIGURE NO. TL-10-1

Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
TL-21-1	1600	5410
TL-24-1	525	2110
TL-12092-F-C	<100	348
TL-12093-F-C	370	1310
TL-12094-F-C	120	565
TL-12095-F-C	450	3090
TL-12096-F-C	130	369
TL-12097-F-Q duplicate of TL-12096-F-C	240	952
TL-12098-F-C	850	2430
TL-12099-F-C	640	1510
TL-12100-F-C	350	916
TL-12101-F-C	590	459
TL-12102-F-C	530	756
TL-12103-F-D	300	744
TL-12118-F-C	200	515
TL-12119-F-D	<100	120
TL-12120-F-C	<100	308
TL-12121-F-C	380	637
TL-12122-F-C	180	1120
TL-12127-F-D	<100	106
TL-12134-F-C	<100	90
TL-12162-F-C	<100	58

Bold	**Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

Lead	2000 mg/kg
Zinc	10000 mg/kg

1500E 1500E 2000E 2500E 3000E

1500N 1000N 500N

REFER TO DEC. 31/03 CLOSE-OUT REPORT: NORTH PORTAL STOCKPILE

REFER TO DEC. 31/03 CLOSE-OUT REPORT: CEMENMT ROCK FILL (CRF) PLANT FUEL STORAGE TANK

REFER TO JUNE 10/05 CLOSE-OUT REPORT: FIRESHALL AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: BARGE AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: ACCOMMODATIONS COMPLEX

REFER TO JUNE 10/05 CLOSE-OUT REPORT: LOON LAKE SNOW DUMP

REFER TO DEC. 31/03 CLOSE-OUT REPORT: OLD CRUSHER AREA

REFER TO DEC. 31/03 CLOSE-OUT REPORT: FORMER FUEL BLADDER STORAGE AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: CONCENTRATE STORAGE SHED AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: SOUTH SHORE

REFER TO JUNE 10/05 CLOSE-OUT REPORT: FOLDAWAY BUILDINGS

REFER TO JUNE 10/05 CLOSE-OUT REPORT: TANK FARM AND LUBE STORAGE AREA

REFER TO DEC. 31/03 CLOSE-OUT REPORT: 2002 FUEL SPILL

REFER TO DEC. 31/03 CLOSE-OUT REPORT: MAIN SNOW DUMP

REFER TO DEC. 31/03 CLOSE-OUT REPORT: TAILINGS THINCKENER AREA

WATER LINE

LOON LAKE

TAILINGS LINE

TAILINGS THICKENER

IMPOUNDMENT BASIN

ACCOMODATIONS

CONCENTRATE SHED

AIRSTRIP

FOLDAWAYS

LUBE STORAGE

TANK FARM

TL-12_20-F-C
TL-12_23-F-C
TL-12_24-F-C
TL-12_25-F-C
TL-12_26-F-C
TL-12_18-F-C
TL-12_19-F-C
TL-121 10-F-C
TL-12_03-F-D
TL-121 11-F-C
TL-121 12-F-C
TL-12_12-F-C
TL-12_18-F-C
TL-12_19-F-D
TL-121 10-F-C
TL-12_11-F-C
TL-12_12-F-C
TL-12_27-F-D
TL-12134-F-C
TL-1-I
TL-1-I

N

0 50 100 200 Metres

SCALE 1:5000

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

AREA – SAMPLE ID – ESP–7–I–D

TYPE: C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 12.25m AREA WALL–3 SAMPLES ALONG 25m OF WALL; D= DISCRETE SAMPLE; Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE

LOCATION: F= FLOOR SAMPLE; I= INTERMEDIATE FLOOR SAMPLE; W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

SOURCE OF DRAWING:

-

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

TAILINGS PIPELINE CONDITIONS AFTER REMEDIATION

Gartner Lee

FIGURE NO. TL-10-2

Appendix G

Loon Lake Snow Dump

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Loon Lake Snow Dump

BACKGROUND

The Loon Lake Snow Dump, shown as Area 18 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan , December 31, 2004,* was one of four areas at the mine site used to store snow collected from travel routes on the Polaris mine site. The snow dumps were identified as areas of environmental concern in the Environmental Site Assessment (ESA) conducted in 1999 and 2000 due to the inclusion of particulates with elevated lead and zinc concentrations. Melting of the snow dumps during the summer may have resulted in the elevated concentrations of metals in soils.

There were twenty (20) soil samples collected from the Loon Lake snow dump as part of the ESA. The samples were collected from eight test pits and four surface soil sampling locations. Two (2) samples, surface sample LL-A and the sample collected from 0 to 0.1 m depth in test pit LLSD-4, returned lead concentrations greater than the Polaris Mine Soil Quality Remediation Objective (SQRO) of 2,000 mg/kg. None of the samples collected exceeded the SQRO for zinc (10 000 mg/kg). Figure LL-18-1: *Loon Lake Snow Dump Conditions Before Remediation* illustrates the original topography of the area, sample results from the ESA, as well as the area estimated following the ESA to be the area of concern for metal contamination.

METHODOLOGY

Delineation

Commencing August 27, 2003, the preliminary boundary of the area to be remediated, identified in the ESA as an "Area of Concern", was further delineated for excavation through the collection and analysis of field screening samples of surface and subsurface material. Gartner Lee Limited (GLL) sampled the soil in accordance with standard GLL and (Teck Cominco Limited) TCL sampling procedures and protocols. One-hundred and thirteen (113) discrete field screening samples were collected from sixty-three (63) surface samples sites and fourteen (14) test pits. This included eleven (11) field duplicate quality assurance quality control samples. GLL collected the samples at 25 meter spaced intervals and analyzed these samples with the Niton portable X-Ray Fluorescence (XRF) elemental analyzer. The results of the analysis are indicated on Figure LL-18-1. Based on the results of the field screening sampling, GLL modified the area to be excavated as indicated by the "Limit of Remedial Excavation" shown on Figure LL-18-1.

Excavation

The excavation at Loon Lake snow dump commenced June 10, 2004 and was completed by August 8, 2004. Melting of the snow dump was accelerated by spreading the piles of snow and ice around with a bulldozer within the area delineated for excavation. The soil and remaining snow and ice within the excavation boundaries was ripped using a ripper tooth on and excavator, and pushed into stockpiles that were loaded out into trucks with an excavator. Field screening samples were collected across the base of the excavation and analysed on-site for metals using the XRF. Additional excavation was undertaken in areas with contiguous lead concentrations greater than 1,200 mg/kg and zinc concentrations greater than 8,500 mg/kg based on results obtained with the XRF. The areas where additional excavation was required were generally associated with ice patches that had not melted. The material excavated was disposed of in the mine workings in accordance with regulatory approvals.

Confirmation Sampling

Confirmation soil samples were collected across the floor of the excavation limits in accordance with standard GLL and TCL sampling procedures and protocols. Composite confirmation samples were collected from areas of the floor that measured approximately 25 m x 25 m. The soil samples were submitted to the analytical laboratory, ALS Environmental of Vancouver, BC to verify that the remaining concentrations of metals in soil met the SQROs. Upon receipt of the soil results that met the SQROs the final excavation limits were surveyed.

ANALYTICAL RESULTS

Analytical laboratory results are summarized in Table L-18-1, along with the approved Polaris Mine SQROs for lead and zinc. A total of seventy-one (71) confirmation soil samples from the former Loon Lake snow dump area were submitted for laboratory analysis fifty-eight (58) composite floor samples, seven (7) discrete floor, and six (6) quality assurance quality control (QA/QC) duplicate samples. The soil quality results and the lateral limits of the excavation are shown on Figure LL-18-2, *Loon Lake Snow Dump Conditions After Remediation*.

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with collecting and analyzing soil were implemented during the remediation of the Loon Lake snow dump area, including the comparison of on-site field screening samples, the submission of blind duplicates to the analytical laboratory, and the analysis of analytical replicates. Relative percent differences (RpD) have been calculated and compiled in Table LL-18-2 for forty-five (45) on-site field screened duplicates, six (6) analytical laboratory duplicates, three (3) analytical laboratory replicates for a total of fifty-four (54) QA/QC sample sets for lead and zinc concentrations.

Fifty (50) of the sample results and their duplicate/replicate results either returned results below the practical quantitation limit, in which case the RpD value has been identified as “na” (not applicable) or they returned acceptable RpDs below the site specific objective of 50%. . Two on-site field screened duplicates, one analytical laboratory duplicate and one of the analytical replicates returned RpDs greater than the objective, 50%.

The variance between the sample and its duplicate or replicate is indicative of sample heterogeneity likely due to the presence of trace amounts of concentrated lead or zinc dust in the sample. Therefore, the metal QA/QC samples from the Loon Lake snow dump area serve to document the variable nature of the metal concentrations in the soil.

Discussion

The seven discrete samples were collected and submitted for laboratory analysis of lead and zinc from six composite sample areas collected in the same area and results were as follows:

Summary of Discrete Sample Results compared to the corresponding Composite Sample Results

Composite Sample ID	Lead (mg/kg)	Zinc (mg/kg)	Discrete Sample ID	Lead (mg/kg)	Zinc (mg/kg)
LL-11737-F-C	680	1780	LL-11423-F-D	73	170
LL-11740-F-C	680	1740	LL-11462-F-D	294	835
LL-11740-F-C	680	1740	LL-11463-F-D	1620	4430
LL-11941-F-C	1940	7460	LL-11502-F-D	<100	210
LL-11954-F-C	310	734	LL-11532-F-D	810	2280
LL-12075-F-C	<50	108	LL-12076-F-D	<100	95
LL-12084-F-C	<100	221	LL-12085-F-D	<100	6

Seventy (70) of the seventy one (71) confirmatory soil sample results from the Loon Lake snow dump area meet the SQROs for lead and zinc. One analytical laboratory duplicate sample (LL-12319-F-Q) returned lead concentrations of 2200 mg/kg, which is greater than the SQRO for lead (2,000 mg/kg). Ten soil samples were analyzed for addition metals. Arsenic concentrations ranged from <10 mg/kg to 14 mg/kg and barium concentrations ranged from 357 mg/kg to 994 mg/kg. The generic Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Parkland land use is 12 mg/kg arsenic and 500 mg/kg barium in soil. The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results,* are considered to be representative of background conditions. Samples were collected at the following intervals surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of arsenic and barium greater than generic CCME CEQG Parkland land use were detected in each interval. The variability of arsenic and barium concentrations in those samples in listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Arsenic and Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Arsenic	12	<5	15.1	12	11 +/- 2.7	13	12.25
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The concentrations of arsenic and barium remaining within the footprint of the Loon Lake snow dump after remediation are within the range of the background concentrations. The presence of arsenic and barium concentrations in soil above the generic CCME guidelines for Parkland land use is therefore attributed to natural background mineralogy. In addition, the immobile nature of the arsenic and barium encountered on site was also demonstrated in the 1999 ESA leachate analysis that returned arsenic and barium concentrations at levels less than the detection limit and they were therefore not identified as a contaminants of concern in the Polaris Mine ESA.

The confirmation samples supported by the QA/QC samples from the Loon Lake snow dump area provide confidence that the remediation of the area complies with the SQROs.

CONCLUSIONS

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the former Loon Lake snow dump area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was

undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Dennis Lu, B.Sc.
Field Scientist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

AL:DL:gc

ATTACHMENTS

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Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-11423-F-D	LL-11462-F-D	LL-11463-F-D	LL-11502-F-D	LL-11532-F-D	LL-11753-F-Q	LL-11605-F-C	LL-11606-F-C
				Date Sampled	8-Jul-04	8-Jul-04	8-Jul-04	8-Jul-04	8-Jul-04	8-Jul-04	21-Jun-04	21-Jun-04
				ALS File Number	U5050	U5050	U5050	U5836	U5836	U5836	U5050	U5050
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	106	297	1724	59	792	duplicate of	160	209
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	315	848	7123	285	3654	LL-11532-F-D	705	941
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	-	-	-	-	-	8.7	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	**13**	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	**723**	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	1.8	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	11	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	7	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	29	-
Lead	T-Pb	2000	-	mg/kg	73	294	1620	<100	810	930	160	140
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	0.12	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	<8	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	37	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	<4	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	82	-
Zinc	T-Zn	10000	-	mg/kg	170	835	4430	210	2280	2370	507	390

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter. for a given parameter.

Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-11607-F-C	LL-11608-F-C	LL-11609-F-C	LL-11610-F-C	LL-11611-F-C	LL-11612-F-C	LL-11613-F-C	LL-11614-F-C
				Date Sampled	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04
				ALS File Number	U5050	U5050	U5050	U5050	U5050	U5050	U5050	U5050
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	212	71	206	235	210	308	149	85
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	939	396	628	910	612	1216	475	407
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	-	-	-	-	-	-	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	170	<100	160	200	150	170	110	<100
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	540	160	464	584	460	413	335	269

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d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter. for a given parameter.

Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-11615-F-C	LL-11616-F-C	LL-11617-F-C	LL-11618-F-C	LL-11709-F-Q	LL-11619-F-C	LL-11620-F-C	LL-11621-F-C
				Date Sampled	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04	21-Jun-04
				ALS File Number	U5050	U5050	U5050	U5050	U5050	U5050	U5050	U5050
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	152	75	210	278	duplicate of	54	34	103
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	651	302	715	995	LL-11618-F-C	349	198	429
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	-	-	-	-	-	8.8	-
Metals					-	-						
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	**13**	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	423	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	<1	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	10	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	7	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	29	-
Lead	T-Pb	2000	-	mg/kg	105	<100	150	250	300	110	<100	<100
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	0.16	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	<8	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	39	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	<4	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	80	-
Zinc	T-Zn	10000	-	mg/kg	296	191	435	723	880	138	110	162

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Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-11622-F-C	LL-11623-F-C	LL-11697-F-C	LL-11698-F-C	LL-11699-F-C	LL-11737-F-C	LL-11738-F-C	LL-11739-F-C
				Date Sampled	21-Jun-04	21-Jun-04	28-Jun-04	28-Jun-04	28-Jun-04	28-Jun-04	28-Jun-04	28-Jun-04
				ALS File Number	U5050	U5050	U5223	U5223	U5223	U5050	U5050	U5050
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	67	81	1397	1372	772	-	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	362	393	5028	6364	3564	-	-	-
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	-	-	-	-	-	-	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<100	110	1360	1400	700	680	210	150
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	141	344	3150	3560	2220	1780	267	355

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Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-11740-F-C	LL-11741-F-C	LL-11742-F-Q	LL-11800-F-C	LL-11802-F-C	LL-11939-F-C	LL-11941-F-C	LL-11944-F-C
				Date Sampled	28-Jun-04	28-Jun-04	28-Jun-04	28-Jun-04	28-Jun-04	8-Jul-04	8-Jul-04	8-Jul-04
				ALS File Number	U5050	U5050	U5050	U5223	U5223	U5836	U5836	U5615r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	-	duplicate of	1106	1364	1131	1460	384
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	-	LL-11741-F-C	5174	8307	3256	5613	1031
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	7.9	-	-	-	8.4	-	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	-	-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	-	<10	-	-	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	-	487	-	-	-	**695**	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	<1	-	-	-	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	-	8.9	-	-	-	7.3	-	-
Chromium	T-Cr	-	64	mg/kg	-	10	-	-	-	10	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	5	-	-	-	<4	-	-
Copper	TCu	-	63	mg/kg	-	24	-	-	-	19	-	-
Lead	T-Pb	2000	-	mg/kg	680	1010	1210	1150	1880	970	1940	255
Mercury	T-Hg	-	7	mg/kg	-	0.08	-	-	-	0.07	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8	-	-	-	<8	-	-
Nickel	T-Ni	-	50	mg/kg	-	26	-	-	-	21	-	-
Selenium	T-Se	-	1	mg/kg	-	<4	-	-	-	<4	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	<4	-	-	-	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	<10	-	-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	-	62	-	-	-	49	-	-
Zinc	T-Zn	10000	-	mg/kg	1740	2970	3520	2940	7660	2590	7460	650

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Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-11946-F-C	LL-11954-F-C	LL-12051-F-C	LL-12052-F-C	LL-12054-F-C	LL-12055-F-C	LL-12056-F-C	LL-12319-F-Q
				Date Sampled	8-Jul-04	8-Jul-04	25-Jul-04	25-Jul-04	25-Jul-04	25-Jul-04	25-Jul-04	25-Jul-04
				ALS File Number	U5836	U5836	U6365r	U6365r	U6365r	U6365r	U6365r	U6365r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	1588	403	1327	1266	494	374	1697	duplicate of
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	6141	1699	3979	3717	1424	1112	4846	LL-12056-F-C
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	8.3	-	-	-	-	-	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	10	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	**906**	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	<1	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	3.5	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	14	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	5	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	19	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	1690	490	1140	1340	310	380	1980	**2200**
Mercury	T-Hg	-	7	mg/kg	-	0.07	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	25	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	<4	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	<4	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	<10	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	75	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	9410	1280	2760	3380	734	976	3020	4100

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Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-12061-F-C	LL-12063-F-C	LL-12064-F-C	LL-12065-F-C	LL-12066-F-C	LL-12075-F-C	LL-12076-F-D	LL-12077-F-C
				Date Sampled	25-Jul-04	25-Jul-04	25-Jul-04	25-Jul-04	25-Jul-04	29-Jul-04	29-Jul-04	29-Jul-04
				ALS File Number	U6365r	U6365r	U6365r	U6365r	U6530rr	U6530rr	U6530rr	U6530rr
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	141	111	355	487	-	70	-	160
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	566	463	1153	1425	-	206	-	451
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					7.3	-	-	-	-	-	-	7.8
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	<20	-	-	-	-	-	-	<20
Arsenic	T-As	-	12	mg/kg	**13**	-	-	-	-	-	-	**12**
Barium	T-Ba	-	500	mg/kg	**730**	-	-	-	-	-	-	**670**
Beryllium	T-Be	-	4[d]	mg/kg	<1	-	-	-	-	-	-	<1
Cadmium	T-Cd	-	10	mg/kg	1.4	-	-	-	-	-	-	<1
Chromium	T-Cr	-	64	mg/kg	15	-	-	-	-	-	-	13
Cobalt	T-Co	-	50[d]	mg/kg	7	-	-	-	-	-	-	6
Copper	TCu	-	63	mg/kg	32	-	-	-	-	-	-	28
Lead	T-Pb	2000	-	mg/kg	140	<100	450	670	104	<50	<100	<100
Mercury	T-Hg	-	7	mg/kg	0.13	-	-	-	-	-	-	0.10
Molybdenum	T-Mo	-	10[d]	mg/kg	<8	-	-	-	-	-	-	<8
Nickel	T-Ni	-	50	mg/kg	44	-	-	-	-	-	-	34
Selenium	T-Se	-	1	mg/kg	<14	-	-	-	-	-	-	<4
Silver	T-Ag	-	20[d]	mg/kg	<4	-	-	-	-	-	-	<4
Tin	T-Sn	-	50[d]	mg/kg	<10	-	-	-	-	-	-	<10
Vanadium	T-V	-	130	mg/kg	98	-	-	-	-	-	-	91
Zinc	T-Zn	10000	-	mg/kg	409	406	1510	1210	1190	108	95.2	266

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter. for a given parameter.

Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump							
				Sample ID	LL-12078-F-C	LL-12079-F-Q	LL-12080-F-C	LL-12081-F-C	LL-12084-F-C	LL-12085-F-D	LL-12104-F-C	LL-12105-F-C
				Date Sampled	29-Jul-04	29-Jul-04	29-Jul-04	29-Jul-04	29-Jul-04	29-Jul-04	2-Aug-04	2-Aug-04
				ALS File Number	U6530rr	U6530rr	U6530rr	U6530rr	U6530rr	U6530rr	U6826rr	U6826rr
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	180	duplicate of	172	106	149	-	168	329
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	564	LL-12078-F-C	482	295	432	-	455	463
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**							
pH					-	-	-	-	-	-	8.1	-
Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	10	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	357	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	1.2	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	14	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	12	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	26	-
Lead	T-Pb	2000	-	mg/kg	<100	120	100	100	<100	<100	150	250
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	0.11	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	<8	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	46	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	<8	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	47	-
Zinc	T-Zn	10000	-	mg/kg	261	357	341	328	221	6.4	367	654

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter. for a given parameter.

Table LL-18-1. Loon Lake Snow Dump Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump						
				Sample ID	LL-12110-F-C	LL-12128-F-C	LL-12135-F-Q	LL-12136-F-C	LL-12137-F-C	LL-12138-F-C	LL-12139-F-C
				Date Sampled	2-Aug-04	5-Aug-04	5-Aug-04	8-Aug-04	8-Aug-04	8-Aug-04	8-Aug-04
				ALS File Number	U6826rr	U6770(1)	U6770(1)	U6898	U6898	U6898	U6898
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	139	81	duplicate of	378	408	397	420
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	417	142	LL-12128-F-C	1206	1417	1524	1443
Parameter		**Site Specific**	**CEQG(PL)[c]**	**Units**	**Analytical Results**						
pH					-	-	-	-	-	-	-
Metals											
Antimony	T-Sb	-	20[d]	mg/kg	<20	-	-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	**12**	-	-	-	**14**	-	-
Barium	T-Ba	-	500	mg/kg	**994**	-	-	-	442	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<1	-	-	-	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	1	-	-	-	2.1	-	-
Chromium	T-Cr	-	64	mg/kg	21	-	-	-	10	-	-
Cobalt	T-Co	-	50[d]	mg/kg	7	-	-	-	9	-	-
Copper	TCu	-	63	mg/kg	29	-	-	-	29	-	-
Lead	T-Pb	2000	-	mg/kg	74	<100	<100	182	180	159	210
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<8	-	-	-	<8	-	-
Nickel	T-Ni	-	50	mg/kg	40	-	-	-	46	-	-
Selenium	T-Se	-	1	mg/kg	<6	-	-	-	<8	-	-
Silver	T-Ag	-	20[d]	mg/kg	<4	-	-	-	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	<10	-	-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	104	-	-	-	75	-	-
Zinc	T-Zn	10000	-	mg/kg	312	89	148	518	637	460	656

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guideline were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter. for a given parameter.

Table LL-18-2. Loon Lake Snow Dump Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump								
				Sample ID	LL-9-I-D	LL-20-I-D	LL-31-I-D	LL-45-I-D	LL-52-I-D	LL-58-I-D	LL-70-I-D	LL-73-1-W-D	LL-75-2-W-D
				Duplicate ID	LL-86-Q	LL-87-Q	LL-88-Q	LL-89-Q	LL-90-Q	LL-91-Q	LL-92-Q	LL-93-Q	LL-94-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		2765	2250	610	530	461	2493	122	4435	74
Duplicate Result	mg/kg	70	350		2636	2534	481	627	529	2372	320	4734	73
RpD	%				5%	12%	24%	17%	14%	5%	na	7%	na
Zinc (Zn)													
Sample Result	mg/kg	150	750		9669	9729	2734	2247	1155	9569	783	24843	431
Duplicate Result	mg/kg	150	750		9135	10463	1862	2452	1506	9039	1318	24653	456
RpD	%				6%	7%	38%	9%	26%	6%	**51%**	1%	na
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table LL-18-2. Loon Lake Snow Dump Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump								
				Sample ID	LL-79-2-W-D	LL-83-3-F-D	LL-11427-F-D	LL-11432-F-D	LL-11441-F-D	LL-11452-F-D	LL-11462-F-D	LL-11508-F-D	LL-11518-F-D
				Duplicate ID	LL-95-Q	LL-96-Q	LL-10508-F-Q	LL-11704-F-Q	LL-11705-F-Q	LL-11706-F-Q	LL-11701-F-Q	LL-11702-F-Q	LL-11703-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		222	70	536	74	126	5039	300	1717	1597
Duplicate Result	mg/kg	70	350		350	23	513	57	134	4166	310	1708	1824
RpD	%				na	na	4%	na	na	19%	na	0%	13%
Zinc (Zn)													
Sample Result	mg/kg	150	750		689	478	1892	205	494	27038	1196	5079	6055
Duplicate Result	mg/kg	150	750		1108	536	2087	241	519	22632	830	5271	6584
RpD	%				47%	na	10%	16%	5%	18%	36%	4%	8%
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table LL-18-2. Loon Lake Snow Dump Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump								
				Sample ID	LL-11530-F-D	LL-11532-F-D	LL-11609-F-C	LL-11618-F-C	LL-11741-F-C	LL-11800-F-C	LL-11800-F-C	LL-11946-F-C	LL-12050-F-C
				Duplicate ID	LL-11700-F-Q	LL-11753-F-Q	LL-11708-F-Q	LL-11709-F-Q	LL-11742-F-Q	QC# 393918	LL-11719-F-Q	QC# 396124	LL-12318-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		1327	-	206	279	-	-	1106	-	4284
Duplicate Result	mg/kg	70	350		1169	-	263	302	-	-	1264	-	4167
RpD	%				13%		na	na			13%		3%
Zinc (Zn)													
Sample Result	mg/kg	150	750		5302	-	828	996	-	-	5174	-	16091
Duplicate Result	mg/kg	150	750		5321	-	1109	999	-	-	5661	-	14077
RpD	%				0%		29%	0%			9%		13%
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	810	-	250	1010	-	-	-	-
Duplicate Result	mg/kg	100	500		-	930	-	300	1210	-	-	-	-
RpD	%					14%		na	18%				
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	2280	-	723	2970	-	-	-	-
Duplicate Result	mg/kg	2	10		-	2370	-	880	3520	-	-	-	-
RpD	%					4%		20%	17%				
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	1150	-	1690	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	2230	-	2390	-
RpD	%									**64%**		34%	
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	2940	-	9410	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	4250	-	6060	-
RpD	%									36%		43%	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table LL-18-2. Loon Lake Snow Dump Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump								
				Sample ID	LL-12052-F-C	LL-12053-F-C	LL-12054-F-C	LL-12056-F-C	LL-12057-F-C	LL-12058-F-C	LL-12059-F-C	LL-12061-F-C	LL-12062-F-C
				Duplicate ID	LL-12323-F-Q	LL-12327-F-Q	LL-12320-F-Q	LL-12319-F-Q	LL-12325-F-Q	LL-12329-F-Q	LL-12328-F-Q	LL-12326-F-Q	LL-12316-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		1266	3250	494	1697	3566	2936	3106	141	3621
Duplicate Result	mg/kg	70	350		1287	3300	408	1393	3513	3573	2633	182	4531
RpD	%				2%	2%	19%	20%	1%	20%	16%	na	22%
Zinc (Zn)													
Sample Result	mg/kg	150	750		3717	11998	1424	4846	14783	11141	10875	566	14985
Duplicate Result	mg/kg	150	750		4091	15473	1231	4725	15669	14330	10524	605	17555
RpD	%				10%	25%	15%	3%	6%	25%	3%	na	16%
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	1980	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	2200	-	-	-	-	-
RpD	%							11%					
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	3020	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	4100	-	-	-	-	-
RpD	%							30%					
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table LL-18-2. Loon Lake Snow Dump Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump								
				Sample ID	LL-12063-F-C	LL-12064-F-C	LL-12065-F-C	LL-12077-F-C	LL-12078-F-C	LL-12080-F-C	LL-12082-F-C	LL-12111-F-C	LL-12128-F-C
				Duplicate ID	LL-12324-F-Q	LL-12317-F-Q	LL-12322-F-Q	QC# 399317	LL-12079-F-Q	LL-12335-F-Q	LL-12083-F-Q	LL-12112-F-Q	LL-12135-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		111	355	487	-	180	173	3290	3300	82
Duplicate Result	mg/kg	70	350		150	345	469	-	172	162	5912	3279	108
RpD	%				na	na	4%		na	na	**57%**	1%	na
Zinc (Zn)													
Sample Result	mg/kg	150	750		463	1153	1425	-	564	482	10060	11102	142
Duplicate Result	mg/kg	150	750		564	1197	1681	-	601	415	16436	10186	98
RpD	%				na	4%	16%		na	na	48%	9%	na
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	<100	-	-	-	<100
Duplicate Result	mg/kg	100	500		-	-	-	-	120	-	-	-	<100
RpD	%								na				na
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	261	-	-	-	89
Duplicate Result	mg/kg	2	10		-	-	-	-	357	-	-	-	148
RpD	%								31%				**50%**
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	<100	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	<100	-	-	-	-	-
RpD	%							na					
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	266	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	267	-	-	-	-	-
RpD	%							0%					

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table LL-18-2. Loon Lake Snow Dump Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Loon Lake Snow Dump				
				Sample ID	LL-12136-F-C	LL-12137-F-C	LL-12138-F-C	LL-12138-F-C	LL-12139-F-C
				Duplicate ID	LL-12357-F-Q	LL-12358-F-Q	LL-12134-F-Q	LL-12359-F-Q	LL-12360-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**				
On Site Field Screening Duplicates									
Lead (Pb)									
Sample Result	mg/kg	70	350		378	408	159	398	420
Duplicate Result	mg/kg	70	350		435	436	<100	396	398
RpD	%				14%	7%	na	1%	6%
Zinc (Zn)									
Sample Result	mg/kg	150	750		1206	1417	460	1524	1443
Duplicate Result	mg/kg	150	750		1339	1381	87	1568	1391
RpD	%				10%	3%	na	3%	4%
Analytical Laboratory Duplicates									
Lead (Pb)									
Sample Result	mg/kg	100	500		-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-
RpD	%								
Zinc (Zn)									
Sample Result	mg/kg	2	10		-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-
RpD	%								
Analytical Laboratory Replicates									
Lead (Pb)									
Sample Result	mg/kg	100	500		-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-
RpD	%								
Zinc (Zn)									
Sample Result	mg/kg	2	10		-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-
RpD	%								

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

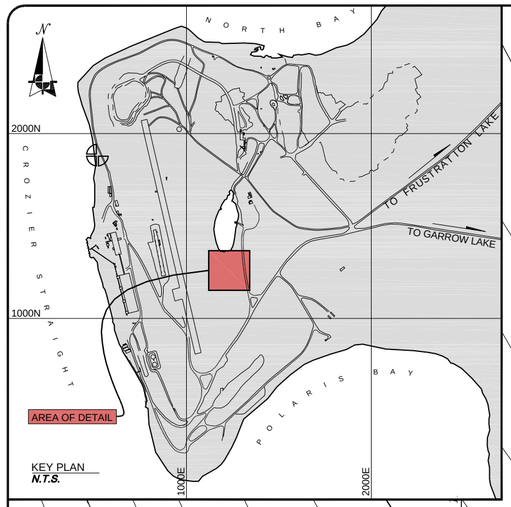
Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*



LOON LAKE

SNOW DUMP

ROAD

1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060

1100 1200 1300

LL-62 LL-61 LL-60 LL-59 LL-58 LL-57
LL-63 LL-35 LL-34 LL-84 LL-33 LL-85 LL-32 LL-31
LL-64 LL-83 LL-26 LL-27 LL-28 LL-29 LL-30
LL-65 LL-39 LL-25 LL-24 LL-82 LL-23 LL-22 LL-81 LL-80 LL-21
LL-66 LL-40 LL-76 LL-16 LL-17 LL-77 LL-18 LL-19 LL-20
LL-67 LL-41 LL-15 LL-14 LL-13 LL-12 LL-79 LL-11
LL-68 LL-42 LL-75 LL-6 LL-7 LL-8 LL-78 LL-9 LL-10 LL-52
LL-69 LL-74 LL-43 LL-5 LL-73 LL-4 LL-3 LL-72 LL-2 LL-71 LL-1 LL-51
LL-70 LL-44 LL-45 LL-46 LL-47 LL-48 LL-49 LL-50

LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)
- FIELD SCREENING SURFACE SAMPLE (2003/2004 ESA)
- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

- FIELD SCREENING RESULTS USING NITON XRF ANALYZER WITH LEAD CONCENTRATIONS IN SOIL <1,500 MG/KG AND/OR ZINC CONCENTRATIONS IN SOIL <8,500 MG/KG
- FIELD SCREENING RESULTS USING NITON XRF ANALYZER WITH LEAD CONCENTRATIONS IN SOIL >=1,500 MG/KG AND/OR ZINC CONCENTRATIONS IN SOIL >=8,500 MG/KG

SOURCE OF DRAWING:

CONTOURS APPROXIMATE, DIGITIZED AND TRANSFORMED FROM BECHTEL FIGURES.

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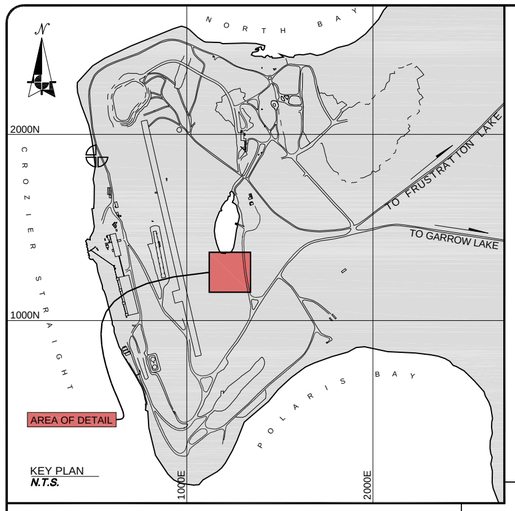
POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

LOON LAKE SNOW DUMP CONDITIONS BEFORE REMEDIATION

Gartner Lee

FIGURE NO. LL-18-1



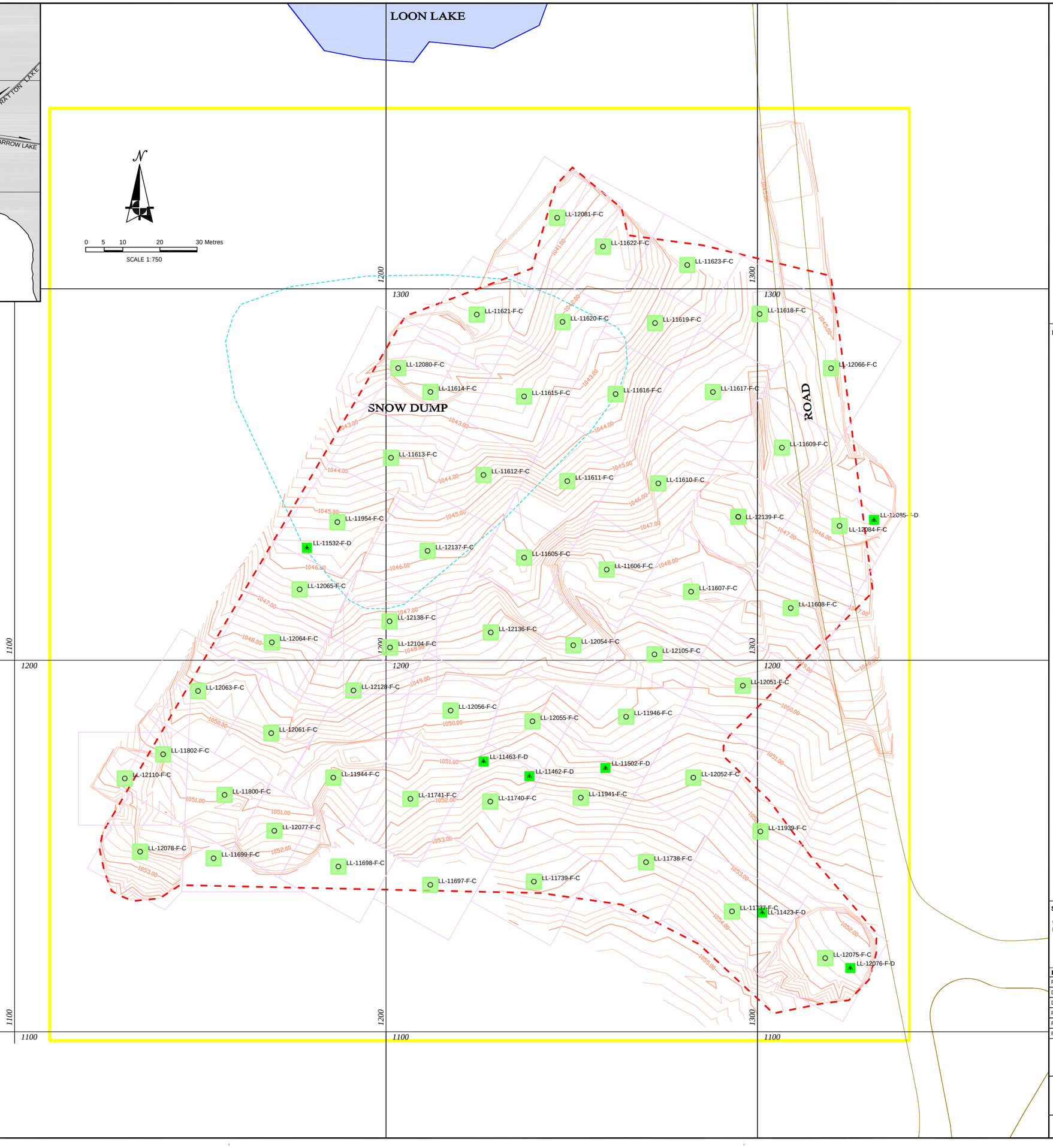
KEY PLAN
N.T.S.

Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
LL-11423-F-D	73	170
LL-11462-F-D	294	835
LL-11463-F-D	1620	4430
LL-11502-F-D	<100	210
LL-11532-F-D	810	2280
LL-11753-F-Q duplicate of LL-11532-F-D	930	2370
LL-11605-F-C	160	507
LL-11606-F-C	140	390
LL-11607-F-C	170	540
LL-11608-F-C	<100	160
LL-11609-F-C	160	464
LL-11610-F-C	200	584
LL-11611-F-C	150	460
LL-11612-F-C	170	413
LL-11613-F-C	110	335
LL-11614-F-C	<100	269
LL-11615-F-C	105	296
LL-11616-F-C	<100	191
LL-11617-F-C	150	435
LL-11618-F-C	250	723
LL-11709-F-Q duplicate of LL-11618-F-C	300	880
LL-11619-F-C	110	138
LL-11620-F-C	<100	110
LL-11621-F-C	<100	162
LL-11622-F-C	<100	141
LL-11623-F-C	110	344
LL-11697-F-C	1360	3150
LL-11698-F-C	1400	3560
LL-11699-F-C	700	2220
LL-11737-F-C	680	1780
LL-11738-F-C	210	267
LL-11739-F-C	150	355
LL-11740-F-C	680	1740
LL-11741-F-C	1010	2970
LL-11742-F-Q duplicate of LL-11741-F-C	1210	3520
LL-11800-F-C	1150	2940
LL-11802-F-C	1880	7660
LL-11939-F-C	970	2590
LL-11941-F-C	1940	7460
LL-11944-F-C	255	650
LL-11946-F-C	1690	9410
LL-11954-F-C	490	1280
LL-12051-F-C	1140	2760
LL-12052-F-C	1340	3380
LL-12054-F-C	310	734
LL-12055-F-C	380	976
LL-12056-F-C	1980	3020
LL-12319-F-Q duplicate of LL-12056-F-C	**2200**	4100
LL-12061-F-C	140	409
LL-12063-F-C	<100	406
LL-12064-F-C	450	1510
LL-12065-F-C	670	1210
LL-12066-F-C	104	1190
LL-12075-F-C	<50	108
LL-12076-F-D	<100	95
LL-12077-F-C	<100	266
LL-12078-F-C	<100	261
LL-12079-F-Q duplicate of LL-12078-F-C	120	357
LL-12080-F-C	100	341
LL-12081-F-C	100	328
LL-12084-F-C	<100	221
LL-12085-F-D	<100	6
LL-12104-F-C	150	367
LL-12105-F-C	250	654
LL-12110-F-C	74	312
LL-12128-F-C	<100	89.1
LL-12135-F-Q duplicate of LL-12128-F-C	<100	148
LL-12136-F-C	182	518
LL-12137-F-C	180	637
LL-12138-F-C	159	460
LL-12139-F-C	210	656

Bold	**Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

Lead	2000 mg/kg
Zinc	10000 mg/kg



LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

ESP–7–I–D
- AREA
- SAMPLE ID
- TYPE: C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA, WALL–5 SAMPLES ALONG 25m OF WALL; D= DISCRETE SAMPLE; Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
- LOCATION: F= FLOOR SAMPLE; I= INTERMEDIATE FLOOR SAMPLE; W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

SOURCE OF DRAWING:

CONTOURS APPROXIMATE, DIGITIZED AND TRANSFORMED FROM BECHTEL FIGURES.

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

LOON LAKE SNOW DUMP CONDITIONS AFTER REMEDIATION

Gartner Lee

FIGURE NO. LL-18-2

Appendix H

Firehall

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: Firehall

BACKGROUND

The Firehall (shown as Area 21 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*) was located north of the former Process Barge.

The Firehall building was a steel building with a concrete floor that served as a storage facility for fire fighting gear and a water truck. An above ground fuel storage tank was located on the west wall of the Firehall building. The 1972 exploration decline portal was located 20 m north of the Firehall building. The rock removed from the 1972 exploration decline portal was stockpiled on the slope to the west. During operations, snow was dumped on the slope west of the exploration portal. A 100 man trailer camp was constructed to the north of the portal. An above ground fuel tank was located on the south side of the camp. Portions of the 100 man trailer camp served as a location for mine rescue and firefighting training during mine operations.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified metal and hydrocarbon contamination in the soil in the Firehall area. Twenty two samples, from fourteen test pits were analyzed for extractable petroleum hydrocarbons (EPH), Lead and Zinc during the ESA. The sample results indicated that elevated metal concentrations in the soil were present from surface to a depth of at least 1.2 m along the slope west of the exploration portal. Hydrocarbon contamination was detected at the south end of the 100 man trailer camp and adjacent to the west and north walls of the Firehall Building. Figure FH-21-1: *Firehall*

Conditions Before Remediation illustrates the sample results from the ESA, the area estimated following the ESA to be of concern for metal and hydrocarbon contamination, as well as the topography of the area prior to remediation.

METHODOLOGY

Delineation

The preliminary boundaries of the remediation area, as identified in the ESA as "Areas of Concern", were further delineated for excavation on the basis of field screening measurements obtained from twenty (20) boreholes drilled and sampled in 2003. The boreholes were advanced with an air rotary quarry drill and composite soil samples were collected over 0.6 m (2 foot) intervals to a maximum depth of 4.9 m. The soil samples were collected from the drill returns that accumulated at the mouth of the borehole. Following the collection of each sample the surface surrounding the borehole was cleared of the drill cuttings, and fresh snow was exposed.

The visual appearance, odour of the soil and field screening measurements obtained from the borehole samples were used to delineate the area to be excavated. Lead and Zinc field screening measurements were obtained using a Niton portable X-Ray Fluorescence (XRF) elemental analyzer in accordance with standard Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols. Hydrocarbon field screening measurements were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. Based on the results of the field screening GLL modified the extent of the area to be excavated as indicated by the "Limit of Remedial Excavation" shown on Figure FH-21-2.

Excavation

Excavation of the contaminated soils in the Firehall area commenced July 1, 2003 following the demolition of the 100 man trailer camp, but prior to the demolition of the Firehall building and the decommissioning of the access roads. In 2003 contaminated soil was excavated above the access road to the main portal and to within 15 m of west side of the Firehall building.

Excavation of contaminated soil in the Firehall area ceased September 8, 2003 when no more contaminated soil could be excavated without removal of the roads or additional buildings. Hydrocarbon contamination remained present in the east wall of the excavation adjacent to the Firehall building at this time. Plastic sheeting was placed along the east wall and a portion of the excavated area backfilled with clean soil in order to improve road access.

In 2004, the Firehall building was demolished and the access road to the main portal removed. Excavation of contaminated soil on the slope west of the exploration portal commenced April 28, 2004 and continued until field screening results indicated that the area would meet the Soil Quality Remediation Objectives (SQRO's) on June 30, 2004. The Firehall building was demolished on May 22, 2004. The excavation of the remaining contaminated soil at the former building commenced May 23, 2004 and was completed by July 6, 2004. The excavation at the former building extended westward until the plastic liner placed in 2003 was intersected.

Soil samples were collected across the floor of the excavation and along the walls. The visual appearance and odour of the soil along with the field screening measurements obtained with the PID and the XRF analyzer were used to further direct the excavation. All material excavated was disposed of in the mine workings in accordance with regulatory approvals. The limits of the excavation are shown on Figure FH-21-2: *Firehall Conditions After Remediation*.

Confirmation Sampling

Upon receipt of field screening results that indicated that the soil remaining in the excavation would meet the SQRO's, confirmation soil samples were collected. The excavation area was subdivided into individual composite sampling areas approximately 25 m by 25 m or less as required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation. Composite samples were created by collecting four or five evenly spaced allocates of soil with in the individual composite sample area. A single allocate of soil from a specific point is a discrete sample.

The soil samples were collected at the excavation limits and submitted to ALS Environmental for analysis of EPH, metals and Polycyclic Aromatic Hydrocarbons (PAH). Additional excavation was undertaken in areas where the laboratory analytical results did not meet the SQRO's and confirmatory samples at the base of excavation. Upon receipt of the analytical results that met the SQRO's for EPH, Lead and Zinc the final excavation limits were surveyed.

ANALYTICAL RESULTS

Quality Assurance and Quality Control (QA/QC)

QA/QC measures associated with collecting and analyzing soil were implemented during the remediation of the Firehall area, including the comparison of on-site field screening samples, the submission of blind duplicates to the analytical laboratory, and the analysis of analytical

laboratory replicates. Relative percent differences (RpDs) have been calculated and compiled in Table FH-21-04 for four (4) analytical laboratory duplicates and four (4) analytical laboratory replicates for hydrocarbon concentrations and Table FH-21-05 for twenty seven (27) field screening duplicates, three (3) analytical laboratory duplicates and six (6) analytical laboratory replicates for Lead and Zinc concentrations for a total of forty four (44) QA/QC samples.

Forty two (42) of the sample sets either returned results below the practical quantitation limit, in which case the RpD value has been identified as "na" (not applicable) or the sample result and its duplicate/replicate result had an acceptable RpD below the site specific remediation objective of 50%. One analytical laboratory duplicate and one analytical laboratory replicate returned RpDs greater than the objective. The variance between these samples and their duplicate/replicate is considered indicative of sample heterogeneity, especially at low concentration levels of Zinc as compared to the SQRO's. The metal QA/QC samples from the Firehall area serve to document the variable nature of the metal concentrations in the soil at the Polaris Mine.

Discussion

Analytical laboratory results for EPH, metals and PAH are summarized in Tables FH-21-01, FH-21-02 and FH-21-03 respectively, along with approved Polaris Mine SQRO's for petroleum hydrocarbons and metals. A total of forty four (44) remediation confirmation soil samples were submitted from the footprint of the area excavated area as follows: nineteen (19) composite floor samples, eighteen (18) composite wall samples, four (4) discrete samples and three (3) Quality Assurance and Quality Control (QA/QC) samples. The soil quality results and lateral limits of the excavation are shown on Figure FH-21-02: *Firehall Conditions After Remediation*.

Discrete samples (for EPH, Lead and Zinc) were collected in addition to the composite sample to discern the homogeneity of the sample area. The table below compares discrete samples to the individual composite sample areas they represented. The results show a variable nature in the metal concentrations and a homogeneity in the hydrocarbon concentrations. These results generally conform to the QA/QC sample data.

Summary of Discrete Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	Lead mg/kg	Zinc mg/kg	EPH C_{10}-C_{19} mg/kg	EPH C_{19}-C_{32} Mg/kg	Discrete Sample ID	Lead mg/kg	Zinc mg/kg	EPH C_{10}-C_{19} mg/kg	EPH C_{19}-C_{32} mg/kg
FH-28-F-C	998	7,890	<200	<200	FH-27-F-D	474	4550	<200	<200
FH-11135-W-C	1,190	7,770	210	<200	FH-11136-W-D	<100	122	420	<200
FH-11344-W-C	250	923	370	<200	FH-11345-W-D	<100	257	320	<200
FH-11922-F-C	<100	169	240	320	FH-11907-F-D	<100	137	<200	270

Thirty four (34) hydrocarbon samples were analyzed for EPH. Of this set, four randomly selected samples were extracted for PAH. Forty one (41) metals samples were submitted for analysis of Lead and Zinc. Of this set, three randomly selected samples were analyzed for total metals.

All the remediation confirmation samples results from the Firehall area meet the SQRO's for EPH, Lead and Zinc. All the samples analyzed for PAH returned values below the generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guideline (CEQG) for parkland land use. One of the three samples analyzed for total metals returned a Barium concentration of 667 mg/kg, which is greater than the generic CCME CEQG for parkland land use of 500 mg/kg Barium in soil.

The presence of Barium concentrations in the soil above the generic CCME guidelines for parkland land use is attributed to natural background mineralogy. Barium is a common mineral associated with lead sulphides, and it is found in cavities in limestone and dolostone. This is demonstrated through soil samples as described below.

Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results,* are considered to be representative of background conditions. Samples were collected at the following intervals surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of Barium greater than generic CCME CEQG Parkland land use were detected in each interval. The variability of Barium concentrations in those samples listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The concentrations of Barium remaining within the footprint of the Firehall area after remediation are within the range of the background concentrations. In addition, the immobile nature of the Barium encountered on site was demonstrated in the ESA leachate test results that returned Barium concentrations at levels less than the detection limit and it was therefore not identified as a contaminant of concern in the ESA.

The confirmatory samples supported by the QA/QC samples from the Firehall area provide confidence that the remediation of the area complies with the SQRO's.

CONCLUSION

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the former Firehall area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgment in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is

not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Brenda Bolton, B.A., B.Sc.
Environmental Geologist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

AL:BB:gc

ATTACHMENTS

Tables

Table FH-21-1	Firehall Remediation Confirmation Soil Samples – Hydrocarbons
Table FH-21-2	Firehall Remediation Confirmation Soil Samples – Metals
Table FH-21-3	Firehall Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table FH-21-4	Firehall Quality Assurance and Quality Control Remediation Soil Samples – Hydrocarbons
Table FH-21-5	Firehall Quality Assurance and Quality Control Remediation Soil Samples – Metals

Figures

Figure FH-21-1	Firehall Conditions Before Remediation
Figure FH-21-2	Firehall Conditions After Remediation

Table FH-21-1. Firehall Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Fire Hall						
		Sample ID	FH-27-F-D	FH-28-F-C	FH-104-F-D	FH-10958-F-C	FH-11016-W-C	FH-11124-W-C	FH-11126-F-C
		Date Sampled	09-Jul-03	09-Jul-03	05-Aug-03	26-Jun-04	01-Jun-04	31-May-04	01-Jun-04
		ALS File Number	T1369	T1369	T2589	U4054r	U4137	U4137	U4137
		Field Screen (ppm)[b]	85	60	-		55	40	60
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	240	910	<200	420	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	760	<200
LEPH[c]	1000	mg/kg	-	-	240	-	<200	-	<200
HEPH[c]	1000	mg/kg	-	-	<200	-	<200	-	<200

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FH-21-1. Firehall Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Fire Hall						
		Sample ID	FH-10472-F-Q	FH-11135-W-C	FH-11136-W-D	FH-11209-F-C	FH-11275-F-C	FH-11344-W-C	FH-11370-W-Q
		Date Sampled	31-May-04	01-Jun-04	01-Jun-04	02-Jun-04	31-May-04	09-Jun-04	09-Jun-04
		ALS File Number	duplicate of	U4137	U4137	U4269r	U4137	U4484	duplicate of
		Field Screen (ppm)[b]	FH-11126-F-C	60	145	70	40	30	FH-11344-W-C
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	210	440	780	460	370	770
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	230	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FH-21-1. Firehall Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Fire Hall						
		Sample ID	FH-11345-W-D	FH-11346-W-C	FH-11347-F-C	FH-11348-W-C	FH-11349-F-C	FH-11478-W-C	FH-11479-W-C
		Date Sampled	09-Jun-04	09-Jun-04	09-Jun-04	09-Jun-04	09-Jun-04	15-Jun-04	15-Jun-04
		ALS File Number	U4484	U4484	U4484	U4484	U4484	U4704r	U4704r
		Field Screen (ppm)[b]	50	45	50	25	15	25	25
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	320	970	490	340	270	270	210
EPH C_{19}-C_{32}	1000	mg/kg	<200	230	<200	<200	<200	500	460
LEPH[c]	1000	mg/kg	-	-	490	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	<200	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FH-21-1. Firehall Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Fire Hall						
		Sample ID	FH-11572-W-C	FH-11635-W-C	FH-11735-W-C	FH-11736-F-C	FH-11764-F-C	FH-11765-F-Q	FH-11803-W-C
		Date Sampled	21-Jun-04	23-Jun-04	21-Jun-04	21-Jun-04	05-Jul-04	05-Jul-04	28-Jun-04
		ALS File Number	U4948	U5050	U4948	U4948	U5597r	duplicate of	U5223
		Field Screen (ppm)[b]	20	20	5	-	-	FH-11764-F-C	20
Parameter	**Site Specific**	**Units**	**Analytical Results**						
Extractable Hydrocarbons									
EPH C_{10}-C_{19}	1000	mg/kg	<200	220	<200	550	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	430	<200	<200	320	390	300
LEPH[c]	1000	mg/kg	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use as .

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FH-21-1. Firehall Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Fire Hall					
		Sample ID	FH-11805-W-C	FH-11862-F-C	FH-11863-F-C	FH-11864-F-C	FH-11907-F-D	FH-11922-F-C
		Date Sampled	29-Jun-04	30-Jun-04	30-Jun-04	30-Jun-04	06-Jul-04	06-Jul-04
		ALS File Number	U5223	U5353r	U5353r	U5353r	U5597r	U5597r
		Field Screen (ppm)[b]	-	-	-	-	15	-
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	230	<200	240
EPH C_{19}-C_{32}	1000	mg/kg	370	<200	<200	400	270	350
LEPH[c]	1000	mg/kg	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table FH-21-2. Firehall Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Firehall								
				Sample ID	FH-27-F-D	FH-28-F-C	FH-105-F-C	FH-111-W-C	FH-112-116-F-C	FH-117-121-W-C	FH-160-F-C	FH-163-W-C	FH-10958-F-C
				Date Sampled	09-Jul-03	09-Jul-03	07-Aug-03	07-Aug-03	07-Aug-03	07-Aug-03	15-Aug-03	20-Aug-03	26-Jun-04
				ALS File Number	T1369	T1369	T2886	T2886	T2886	T2886	T3069	T3179	U4054r
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	-	-	270	199	-	-	116	52	-
				Field Screen Zn (ppm)[b]	-	-	1467	513	-	-	548	448	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**								
pH		-	-	-	-	-	-	-	-	-	-	-	-
Total Metals													
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	474	998	<200	<200	<200	514	212	148	300
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	4550	7890	883	791	145	793	428	940	4500

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FH-21-2. Firehall Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	Firehall							
				Sample ID	FH-11016-W-C	FH-11124-W-C	FH-11126-F-C	FH-10472-F-Q	FH-11135-W-C	FH-11136-W-D	FH-11209-F-C	FH-11275-F-C
				Date Sampled	01-Jun-04	31-May-04	01-Jun-04	01-Jun-04	01-Jun-04	01-Jun-04	02-Jun-04	31-May-04
				ALS File Number	U4137	U4137	U4137	U4137	U4137	U4137	U4269r	U4137
				Field Screen Pb (ppm)[b]	100	382	123	duplicate of	731	21	258	144
				Field Screen Zn (ppm)[b]	508	1253	894	FH-11126-F-C	4003	123	1285	566
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH		-	-	-	-	-	8.34	-	-	-	-	-
Total Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	<20	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	<10	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	452	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	<1	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	1.2	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	<4	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	<4	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	3	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	230	1160	150	180	1190	<100	160	260
Mercury	T-Hg	-	6.6	mg/kg	-	-	<0.05	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	<8	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	<10	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	<4	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	<4	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	<10	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	20	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	2230	2450	474	1610	7770	122	884	802

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FH-21-2. Firehall Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Firehall							
				Sample ID	FH-11344-W-C	FH-11370-W-Q	FH-11345-W-D	FH-11346-W-C	FH-11347-F-C	FH-11348-W-C	FH-11349-F-C	FH-11478-W-C
				Date Sampled	09-Jun-04	09-Jun-04	09-Jun-04	09-Jun-04	09-Jun-04	09-Jun-04	09-Jun-04	15-Jun-04
				ALS File Number	U4484	U4484	U4484	U4484	U4484	U4484	U4484	U4704r
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	240	duplicate of	112	489	287	317	320	-
				Field Screen Zn (ppm)[b]	1100	FH-11344-W-C	610	1812	917	1882	1010	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH		-	-	-	-	-	-	-	8.68	-	-	-
Total Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	<20	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	<10	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	455	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	<1	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	4.5	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	<4	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	<4	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	3	-	-	-
Lead	T-Pb	2000	-	mg/kg	250	240	<100	460	180	480	230	<100
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	-	<0.05	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	<8	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	<10	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	<4	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	<4	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	<10	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	18	-	-	-
Zinc	T-Zn	10000	-	mg/kg	923	917	254	1880	1370	1770	1180	225

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FH-21-2. Firehall Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Firehall							
				Sample ID	FH-11479-W-C	FH-11572-W-C	FH-11635-W-C	FH-11666-W-C	FH-11667-W-C	FH-11668-F-C	FH-11735-W-C	FH-11736-F-C
				Date Sampled	15-Jun-04	21-Jun-04	23-Jun-04	25-Jun-04	25-Jun-04	25-Jun-04	21-Jun-04	21-Jun-04
				ALS File Number	U4704r	U4948	U5050	U5223	U5223	U5223	U4948	U4948
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	-	-	32	72	75	57	200	-
				Field Screen Zn (ppm)[b]	-	-	203	281	243	208	901	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH		-	-	-	-	-	-	8.02	-	-	-	-
Total Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<10	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	9.4	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	**667**	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<0.5	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	0.61	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	12	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	7	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	30	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	180	300	<50	54	65	<50	200	<100
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	0.118	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	4	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	38	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<3	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<2	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<5	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	85	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	388	2190	56.5	135	195	142	704	25.7

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FH-21-2. Firehall Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	Firehall							
				Sample ID	FH-11764-F-C	FH-11765-F-Q	FH-11862-F-C	FH-11863-F-C	FH-11864-F-C	FH-11873-F-C	FH-11907-F-D	FH-11922-F-C
				Date Sampled	05-Jul-04	05-Jul-04	30-Jun-04	30-Jun-04	30-Jun-04	05-Jul-04	06-Jul-04	06-Jul-04
				ALS File Number	U5597r	U5597r	U5353r	U5353r	U5353r	U5597r	U5597r	U5597r
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	-	duplicate of	-	-	-	-	92	-
				Field Screen Zn (ppm)[b]	-	FH-11764-F-C	-	-	-	-	249	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**							
pH		-	-	-	-	-	-	-	-	-	-	-
Total Metals												
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	140	120	<100	<100	190	310	<100	<100
Mercury	T-Hg	-	6.6	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	386	280	23.5	71.5	572	165	137	169

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FH-21-3. Firehall Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	Firehall			
		Sample ID	FH-104-F-D	FH-11016-W-C	FH-11126-F-C	FH-11347-F-C
		Date Sampled	05-Aug-03	01-Jun-04	01-Jun-04	09-Jun-04
		ALS File Number	T2589	U4137	U4137	U4484
		Field Screen (ppm)[b]	-	55	60	50
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**			
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	-	mg/kg	<0.04	<0.04	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	0.07	<0.05	<0.05	<0.2
Phenanthrene	5[d]	mg/kg	<0.05	<0.05	<0.05	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table FH-21-4. Firehall Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee				Location	Firehall							
				Sample ID	FH-11017-W-C	FH-11123-F-C	FH-11126-F-C	FH-11344-W-C	FH-11349-F-C	FH-11738-W-C	FH-11764-F-C	FH-11764-F-C
				Duplicate ID	QC# 389244	QC# 389245	FH-10472-W-Q	FH-11370-W-Q	QC# 390735	QC# 392657	FH-11765-F-Q	QC# 395247
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**							
Analytical Laboratory Duplicates												
EPH C_{10}-C_{19}												
Sample Result	mg/kg	200	1000		-	-	<200	370	-	-	<200	<200
Duplicate Result	mg/kg	200	1000		-	-	<200	770	-	-	<200	250
RpD	**%**						na	na			na	na
EPH C_{19}-C_{32}												
Sample Result	mg/kg	200	1000		-	-	<200	<200	-	-	320	320
Duplicate Result	mg/kg	200	1000		-	-	<200	<200	-	-	390	450
RpD	**%**						na	na			na	na
Analytical Laboratory Replicates												
EPH C_{10}-C_{19}												
Sample Result	mg/kg	200	1000		<200	1460	-	-	270	<200	-	-
Duplicate Result	mg/kg	200	1000		<200	1890	-	-	270	<200	-	-
RpD	**%**				na	26%			na	na		
EPH C_{19}-C_{32}												
Sample Result	mg/kg	200	1000		<200	520	-	-	<200	<200	-	-
Duplicate Result	mg/kg	200	1000		<200	460	-	-	<200	<200	-	-
RpD	**%**				na	na			na	na		

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table FH-21-5. Firehall Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Firehall								
				Sample ID	FH-BH-2-4-C	FH-BH-2-7-C	FH-BH-5-3-C	FH-BH-7-4-C	FH-BH-8-8-C	FH-BH-9-2-C	FH-BH-10-1-C	FH-BH-11-4-C	FH-BH-12-2-C
				Duplicate ID	FH-BH-2-4-Q	FH-BH-2-9-Q	FH-BH-5-10-Q	FH-BH-7-10-Q	FH-BH-8-11-Q	FH-BH-9-8-Q	FH-BH-10-9-Q	FH-BH-11-8-Q	FH-BH-12-10-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)					na								
Sample Result	mg/kg	70	350		152	20	20	20	485	2419	1450	40	54
Duplicate Result	mg/kg	70	350		121	20	20	32	418	2109	1829	51	80
RpD	%				na	na	na	na	15%	14%	23%	na	na
Zinc (Zn)													
Sample Result	mg/kg	150	750		411	60	60	610	3120	13299	5459	431	287
Duplicate Result	mg/kg	150	750		418	225	60	598	3328	12800	6349	171	303
RpD	%				na	na	na	na	6%	4%	15%	na	na
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	3	15		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-	-	-	-
RpD	%												

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table FH-21-5. Firehall Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Firehall								
				Sample ID	FH-BH-13-2-C	FH-BH-14-6-C	FH-BH-15-1-C	FH-BH-15-3-C	FH-BH-18-3-C	FH-BH-18-7-C	FH-59-W-D	FH-97-F-C	FH-105-F-C
				Duplicate ID	FH-BH-13-6-Q	FH-BH-14-7-Q	FH-BH-15-7-Q	FH-BH-15-8-Q	FH-BH-18-8-Q	FH-BH-18-9-Q	FH-165-W-Q	FH-98-F-Q	FH-105-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		1160	67	374	2680	40	130	6860	285	270
Duplicate Result	mg/kg	70	350		994	53	287	2290	34	108	6264	318	272
RpD	%				15%	na	na	16%	na	na	9%	na	na
Zinc (Zn)													
Sample Result	mg/kg	150	750		6829	225	1550	27699	404	577	37016	1764	1467
Duplicate Result	mg/kg	150	750		5978	214	1160	25498	347	465	37923	1102	1396
RpD	%				13%	na	29%	8%	na	na	2%	46%	5%
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-	-
RpD	%												
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-	-
RpD	%												
Zinc (Zn)													
Sample Result	mg/kg	3	15		-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-	-	-	-
RpD	%												

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table FH-21-5. Firehall Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Firehall								
				Sample ID	FH-110-W-D	FH-111-W-C	FH-135-W-D	FH-145-W-D	FH-158-F-D	FH-11126-F-C	FH-11344-W-C	FH-11764-F-C	FH-11764-F-C
				Duplicate ID	FH-110-W-Q	QC# 350292	FH-139-W-Q	FH-148-W-Q	FH-158-F-Q	FH-10472-W-Q	FH-11370-W-Q	FH-11765-F-Q	QC# 395247
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350		204	199	12790	11203	55	-	-	-	-
Duplicate Result	mg/kg	70	350		190	195	13627	7220	65	-	-	-	-
RpD	%				na	na	6%	43%	na				
Zinc (Zn)													
Sample Result	mg/kg	150	750		593	513	72354	72692	304	-	-	-	-
Duplicate Result	mg/kg	150	750		603	455	61522	54744	684	-	-	-	-
RpD	%				na	na	16%	28%	na				
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	-	-	-	-	150	250	140	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	180	240	120	-
RpD	%									18%	4%	15%	
Zinc (Zn)													
Sample Result	mg/kg	2	10		-	-	-	-	-	474	923	386	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	1610	917	280	-
RpD	%									**109%**	1%	32%	
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500		-	<200	-	-	-	-	-	-	140
Duplicate Result	mg/kg	100	500		-	232	-	-	-	-	-	-	120
RpD	%					na							15%
Zinc (Zn)													
Sample Result	mg/kg	3	15		-	791	-	-	-	-	-	-	386
Duplicate Result	mg/kg	3	15		-	1720	-	-	-	-	-	-	342
RpD	%					**74%**							12%

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table FH-21-5. Firehall Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	Firehall							
				Sample ID	FH-11017-W-C	FH-11123-F-C	FH-11349-F-C	FH-11726-F-D	FH-11668-F-C	FH-11691-W-D	FH-11580-F-D	FH-11738-W-C
				Duplicate ID	QC# 389244	QC# 389245	QC# 390735	FH-11711-F-Q	FH-11716-F-Q	FH-11718-W-Q	FH-11720-F-Q	QC# 392657
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**							
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350		-	-	-	45	57	37	24	-
Duplicate Result	mg/kg	70	350		-	-	-	25	77	55	30	-
RpD	%							na	na	na	na	
Zinc (Zn)												
Sample Result	mg/kg	150	750		-	-	-	147	208	220	205	-
Duplicate Result	mg/kg	150	750		-	-	-	187	219	375	179	-
RpD	%							na	na	na	na	
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-	-
RpD	%											
Zinc (Zn)												
Sample Result	mg/kg	2	10		-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	2	10		-	-	-	-	-	-	-	-
RpD	%											
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		120	1390	230	-	-	-	-	200
Duplicate Result	mg/kg	100	500		<100	1500	240	-	-	-	-	180
RpD	%				na	8%	0					11%
Zinc (Zn)												
Sample Result	mg/kg	3	15		552	4270	1180	-	-	-	-	704
Duplicate Result	mg/kg	3	15		376	4140	992	-	-	-	-	533
RpD	%				38%	3%	17%					28%

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

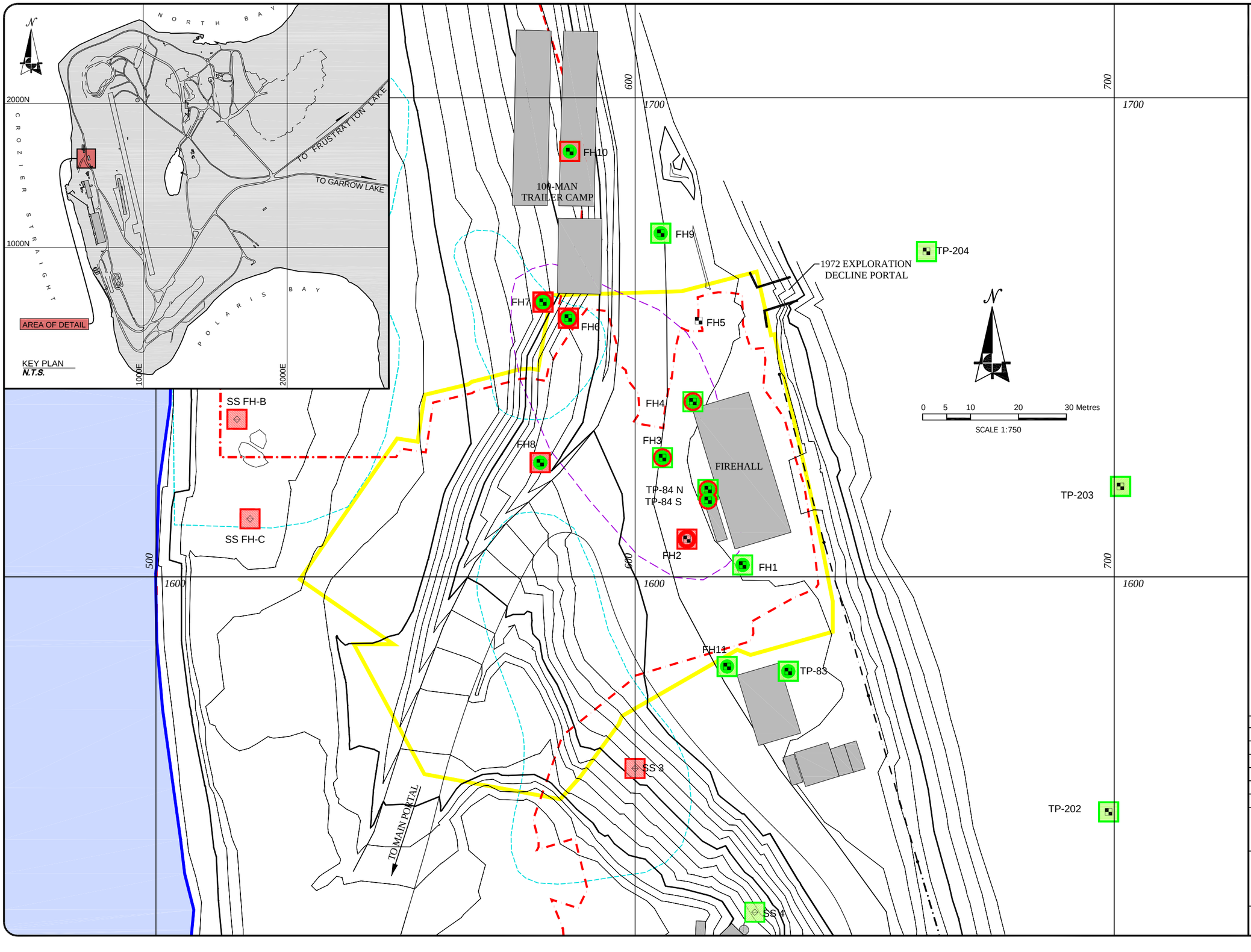
Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.



LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20-6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

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REVIEWED BY:	AL
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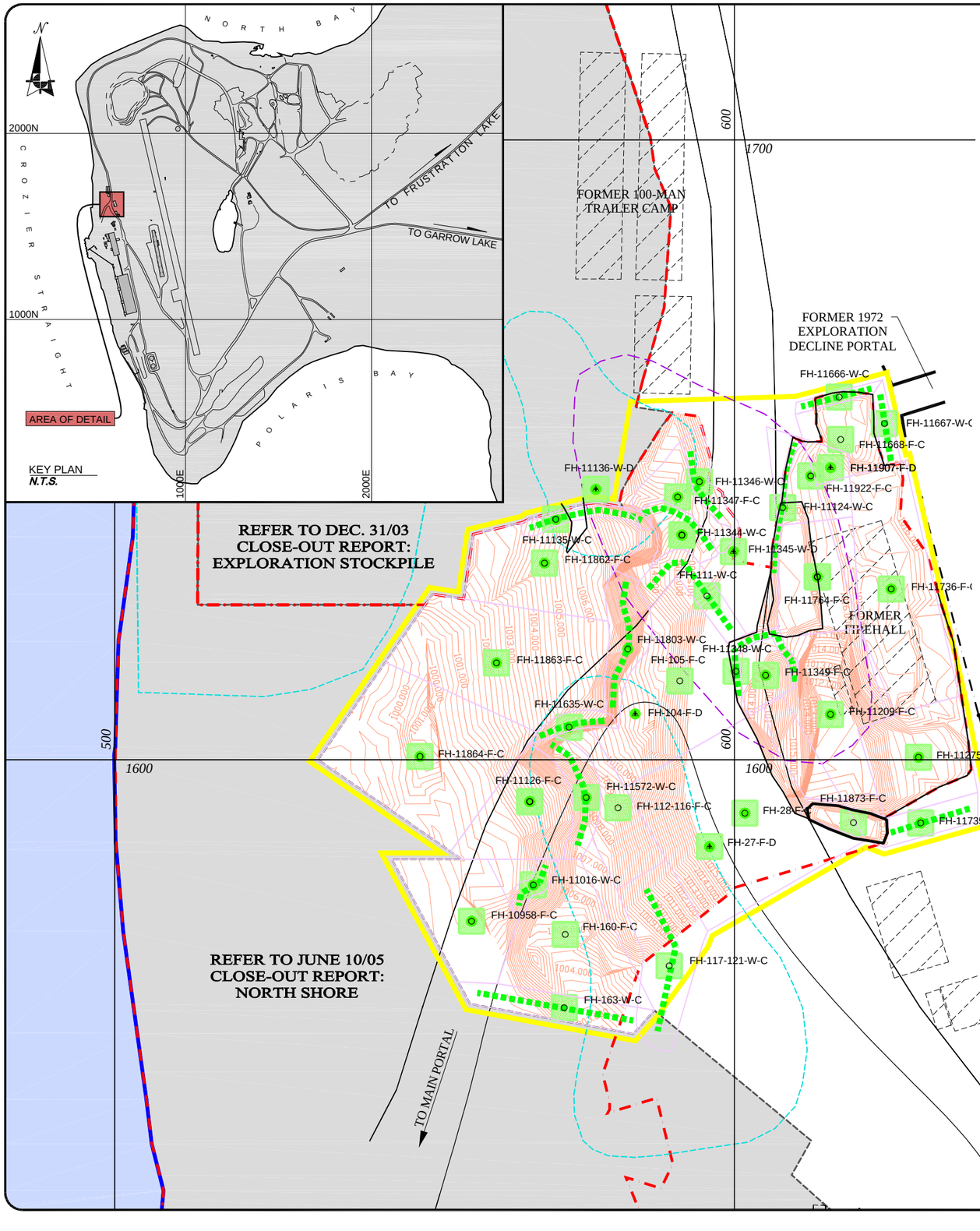
REVISION:	0

POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

FIREHALL CONDITIONS BEFORE REMEDIATION

Gartner Lee

Figure No. **FH-21-1**



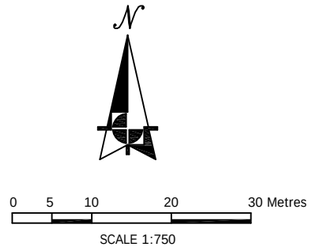
Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
FH-105-F-C	<200	883
FH-111-W-C	<200	791
FH-112-116-F-C	<200	145
FH-117-121-W-C	514	793
FH-160-F-C	212	428
FH-163- W-C	148	940
FH-28-F	998	7890
FH-10472-W-Q duplicate of FH-11126-F-C	180	1610
FH-11016-W-C	230	2230
FH-11017-W-C	120	552
FH-11124-W-C	1160	2450
FH-11126-F-C	150	474
FH-11135-W-C	1190	7770
FH-11209-F-C	160	884
FH-11275-F-C	260	802
FH-11344-W-C	250	923
FH-11346-W-C	460	1880
FH-11347-F-C	180	1370
FH-11348-W-C	480	1770
FH-11349-F-C	230	1180
FH-11370-W-Q duplicate of FH-11344-W-C	240	917
FH-11478-W-C	<100	225
FH-11479-W-C	180	388
FH-11572-W-C	300	2190
FH-11635-W-C	<50	56.5
FH-11666-W-C	54	135
FH-11667-W-C	65	195
FH-11668-F-C	<50	142
FH-11735-W-C	200	704
FH-11736-F-C	<100	25.7
FH-11764-F-C	140	386
FH-11765-F-Q duplicate of FH-11764-F-C	120	280
FH-11862-F-C	<100	23.5
FH-11863-F-C	<100	71.5
FH-11864-F-C	190	572
FH-11873-F-C	310	165
FH-11922-F-C	<100	169

Confirmation Sample ID	EPH C10-C19 mg/kg	EPH C19-C32 mg/kg
FH-27-F	<200	<200
FH-28-F	<200	<200
FH-104-F-C	240	<200
FH-10472-W-Q duplicate of FH-11126-F-C	<200	<200
FH-11016-W-C	<200	<200
FH-11017-W-C	<200	<200
FH-11019-W-C	230	<200
FH-11124-W-C	420	760
FH-11126-F-C	<200	<200
FH-11134-F-C	290	<200
FH-11135-W-C	210	<200
FH-11136-W-D	440	<200
FH-11209-F-C	780	230
FH-11275-F-C	460	<200
FH-11279-F-C	<200	260
FH-11344-W-C	370	<200
FH-11345-W-D	320	<200
FH-11346-W-C	970	230
FH-11347-F-C	490	<200
FH-11348-W-C	340	<200
FH-11349-F-C	270	<200
FH-11370-W-Q duplicate of FH-11334-W-C	770	<200
FH-11478-W-C	270	500
FH-11479-W-C	210	460
FH-11572-W-C	<200	<200
FH-11635-W-C	220	430
FH-11735-W-C	<200	<200
FH-11736-F-C	550	<200
FH-11764-F-C	<200	320
FH-11765-F-Q duplicate of FH-11764-F-C	<200	390
FH-11803-W-C	<200	300
FH-11805-W-C	<200	370
FH-11862-F-C	<200	<200
FH-11863-F-C	<200	<200
FH-11864-F-C	230	400
FH-11907-F-D	<200	270
FH-11922-F-C	240	350

Bold — **Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

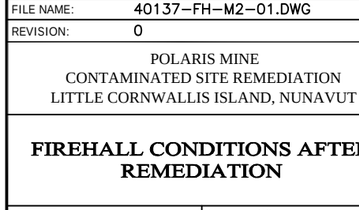
EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg



LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION



- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- *EPH – EXTRACTABLE PETROLEUM HYDROCARBONS
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

DRAWING INFORMATION:	
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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

FIREHALL CONDITIONS AFTER REMEDIATION

Gartner Lee

Figure No.
FH-21-2

Appendix I

South Shore

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: South Shore

BACKGROUND

The South Shore area surrounded the former concentrate storage shed and extended west to Crozier Strait (shown as Area 25 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*). Rock fill was used to level and expand the shoreline an additional 15 m (approximately) into Crozier Strait during construction. During the operation of the mine, the South Shore area was used as a storage yard for shipping containers. Several roads and a fuel line, that extended from the dock to the tank farm, crossed the area.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified metal contamination in the soil surrounding the concentrate shed on the South Shore. Two surface samples were collected, thirty one (31) test pits excavated and two (2) boreholes drilled during the ESA. The sample results indicated that elevated metal concentrations in the soil was limited to the upper 0.3 m between the south end of the concentrate storage shed and the shore. Between the north end of the concentrate storage shed and the shore elevated metal concentrations were encountered from surface to a depth of at least 1.5 m. No indication of hydrocarbon contamination was encountered during the ESA. The sample locations and an indication of results are shown on Figure SS-25-1: S*outh Shore Conditions Before Remediation*.

The sources of contaminate were attributed to lead and zinc concentrates being dispersed by wind and vehicle tracking from the concentrate storage shed and the conveyor to the shiploader at the dock. In addition, fill brought in to expand the shoreline during the construction and to repair eroded areas during the operation of the mine occasionally contained mineralized rock from near the ore zone and it was determined that it was to be excavated as part of the remedial work.

METHODOLOGY

Delineation

The preliminary boundaries of the remediation area, as identified in the ESA as "Areas of Concern" were not further delineated prior to excavation commencing along the shoreline in 2004. In 2004, further delineation of the remedial area was undertaken at the north end of the former concentrate storage shed by drilling eight boreholes and collecting field screening samples. The drill results determined that the metal contamination was bound vertically by bedrock at depths ranging from 0.3 m to 1.0 m below pre-excavation grades. Lead and zinc field screening measurements were obtained using a Niton portable X-Ray Fluorescence (XRF) elemental analyzer in accordance with standard Gartner Lee Limited (GLL) and Teck Cominco Limited (TCL) sampling procedures and protocols.

Excavation

The excavation of the South Shore area occurred from June 11, 2003 to October 23, 2003 and then again from April 19, 2004 to July 23, 2004. Material from the South Shore area was initial broken up for excavation utilising a ripper tooth attached to an excavator or onto the back of the D8 and D10 bulldozers. An excavator bucket was used to pick up the loosed material within the excavation, stockpile it and then load it onto trucks.

In 2003, a strip approximately 45 m wide from the dock cells to within 60 m of the foldaway buildings following the shoreline was removed. A berm was maintained between the ocean and the excavated area. The berm provided protection from the ocean flooding the area being excavated, as well as minimizing erosion in the marine foreshore area. Removal of the berm took place in May 2004 during periods of low tide. At this time ice still bound the foreshore and interaction with the marine foreshore was therefore reduced. Daily turbidity and Total Suspended Solids (TSS) levels were monitored prior to, during and immediately following periods of work in the foreshore in accordance with approved site procedures and protocols. Excavation activities were halted and mitigation measures implemented as required to address potential sediment releases into the marine environment.

In 2004, excavation occurred north and south of the former concentrate storage shed. During excavation at the north end of the concentrate storage shed, hydrocarbon contaminated soil was encountered. One source of hydrocarbon contamination originated at the fuel coupling located down slope of the road east of the barge (1313N, 680E). The contamination was found to have migrated downhill towards the gully that contained the conveyor-way from the barge to the concentrate shed. At this point the hydrocarbon contamination continued down gradient into the barge area. A second source of hydrocarbon contamination was located at a bend in the fuel line near the concentrate conveyor to the shiploader (1298N, 622E). Hydrocarbon contamination from this point source was found to have migrated down gradient towards the barge.

To direct the excavation activities, soil samples were collected across the floor excavation limits in accordance with standard GLL and TCL sampling procedures and protocols. Samples were field screened for metals using the XRF analyzer and for hydrocarbons using the portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. Additional excavation was undertaken where sample results indicated the lead and zinc or hydrocarbon concentrations were greater than the Polaris Mine Soil Quality Remediation Objectives (SQRO's).

The final limits of the excavation areas are shown on Figure SS-25-2: *South Shore Conditions After Remediation*. The material excavated was disposed in the mine workings in accordance with regulatory approvals.

Confirmation Sampling

Upon receipt of field screening results that indicated that the soil remaining in the excavation would meet the SQRO's, confirmation soil samples were collected. The excavation area was subdivided into individual composite sampling areas approximately 25 m by 25 m or less as required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation.

Soil samples were collected at the excavation limits and submitted to ALS Environmental for analysis of Extractable Petroleum Hydrocarbons (EPH), metals and Polycyclic Aromatic Hydrocarbons (PAH). Additional excavation was undertaken in areas that did not meet the SQRO's and additional confirmatory samples taken upon completion of excavation. Upon receipt of the analytical results that met the SQRO's the final excavation limits were surveyed.

ANALYTICAL RESULTS

Analytical laboratory results for EPH, metals and PAH are summarized in Tables SS-25-1, SS-25-2 and SS-25-3 along with the approved Polaris Mine SQRO's for petroleum hydrocarbons and metals. A total of four (4) hydrocarbon and one hundred fifty seven (157) metals remediation confirmation samples were submitted from the South Shore area. All of the hydrocarbon remediation confirmation samples were composite floor samples. Of the metals remediation confirmation samples there were one hundred sixteen (116) composite floors, nineteen (19) discrete floors, four (4) composite walls, one (1) discrete wall, and seventeen (17) quality assurance quality control (QA/QC) samples. The soil quality results and lateral limits of the excavation are shown on Figure SS-25-2.

Quality Assurance and Quality Control (QA/QC)

Relative percent differences (RpDs) have been calculated and compiled in Table SS-25-4 for thirty-one (31) field screening duplicates, seventeen (17) analytical laboratory duplicates and seventeen (17) analytical laboratory replicates for a total of sixty-five (65) QA/QC samples.

Sixty (60) of the sample results and their duplicate/replicate results returned RpDs below the practical quantitation limit (PQL), in which case the RpD value has been identified as "na" (not applicable), or returned acceptable RpDs, below the site specific remediation protocol of 50%. One on-site field screened duplicate and four of the analytical laboratory duplicates returned RpDs greater than the objective. The variance between these samples and their duplicates is considered indicative of sample heterogeneity, especially at low concentration levels of lead and zinc as compared to the SQRO's. The metal QA/QC samples from the South Shore area serve to document the variable nature of the metal concentrations in the soil at the Polaris Mine.

Polaris Mine Soil Quality Remediation Objectives

All of the hydrocarbon remediation confirmation samples returned results below the Polaris Mines SQRO's for EPH and PAH. All of the metal remediation confirmation composite samples returned results below the Polaris Mine SQRO's for lead and zinc. One of the twenty discrete samples, (sample Shore-11987-F-D), returned a lead concentration of 2,600 mg/kg which is greater than the SQRO of 2,000 mg/kg. The lead exceedance is less than two times the SQRO and is therefore in accordance with the approved site remedial protocol that stipulates "that contaminant concentrations in any residual soils will not exceed twice the SQRO's".

Discrete samples were collected to discern the homogeneity of the sample area for lead and zinc. The table below shows a comparison of discrete samples versus the composite areas they represented.

Summary of Discrete Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	Lead (mg/kg)	Zinc (mg/kg)	Discrete Sample ID	Lead (mg/kg)	Zinc (mg/kg)
Shore-52-F-C	135	645	Shore-59-F-D	<100	273
Shore-77-F-C	166	527	Shore-79-F-D	279	1220
Shore-76-F-C	121	365	Shore-78-F-D	202	967
Shore-56-F-C	225	991	Shore-466-F-D	1790	7800
Shore-54-F-C	208	1100	Shore-462-F-D	300	1530
Shore-146-F-C	553	1330	Shore-144-F-D	256	1360
Shore-11303-F-C	1170	3130	Shore-10775-F-D	220	526
Shore-10821-F-C	560	861	Shore-10779-F-D	680	1190
Shore-11368-F-C	310	1630	Shore-10947-F-D	310	1740
Shore-11308-F-C	270	1380	Shore-10956-F-D	210	1510
Shore-11747-F-C	290	822	Shore-11317-F-D	<100	241
Shore-11366-F-C	310	1380	Shore-11338-F-D	270	1290
Shore-11744-F-C	<50	101	Shore-11565-F-D	<50	69
Shore-11669-F-C	180	467	Shore-11649-F-D	319	1220
Shore-11364-F-C	110	747	Shore-11722-F-D	232	1340
Shore-11747-F-C	290	822	Shore-11854-F-D	<100	114
Shore-11998-F-C	<100	51	Shore-11964-F-D	320	934
Shore-11485-F-C	610	3020	Shore-11987-F-D	**2600**	4400
Shore-11821-F-C	228	616	Shore-11988-F-D	210	424
Shore-12074-W-C	93	361	Shore-12071-W-D	295	473

Generic Federal Soil Quality Guidelines for Parkland Land Use

A total of twenty (20) randomly selected samples were analysed for total metals as follows: fourteen (14) composite samples, five (5) discrete samples and one Quality Assurance and Quality Control sample.

Barium concentrations ranged from 192 mg/kg to 1,100 mg/kg. Sixteen (16) of the samples exceeded the generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guideline (CEQG) for parkland land use of 500 mg/kg Barium in soil. One sample with a Barium concentration of 608 mg/kg returned an Arsenic concentration of 15 mg/kg, which exceeds generic CCME CEQG for parkland land use of 12 mg/kg Arsenic in soil. Cadmium concentrations ranged from 1.4 mg/kg to 17.8 mg/kg. The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

Barium is a common mineral associated with lead sulphides, and it is found in cavities in limestone and dolostone. Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling*

Results, are considered to be representative of background conditions. Samples were collected at the following intervals surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations of arsenic and barium greater than generic CCME CEQG Parkland land use were detected in each interval. The variability of arsenic and barium concentrations in those samples in listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Arsenic and Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Arsenic	12	<5	15.1	12	11 +/- 2.7	13	12.25
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The concentrations of arsenic and barium remaining within the footprint of the South Shore area after remediation are within the range of the background concentrations. In addition, the immobile nature of the Arsenic and Barium encountered on site was demonstrated in the ESA leachate test results that returned Arsenic and Barium concentrations at levels less than the detection limit and they were therefore not identified as a contaminants of concern in the ESA.

Two (2) of the discrete samples (Shore-466-F-D and Shore-11987-F-D) exceeded the CCME CEQG parkland land use of 10 mg/kg Cadmium in soil (Sample Shore-11987-F-D also returned lead concentrations greater than the SQRO). Cadmium was not identified as a contaminant of concern based on the total metal analyses and leachate test results conducted during the ESA. Given the immobile nature of the Cadmium encountered on site, as demonstrated by the leachate results, the relatively low level of concentrations (less than twice the generic CCME guidelines for Parkland land use) and the lack of elevated concentrations being detected in the composite samples, no further remedial excavation work is considered necessary.

The confirmatory samples supported by the QA/QC samples from the South Shore area provide confidence that the remediation of the area complies with the SQRO's.

CONCLUSIONS

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the South Shore area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Ltd. and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Dennis Lu, B.Sc.
Field Scientist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

AL:DL:gc

ATTACHMENTS

Tables

Table SS-25-1:	South Shore Remediation Confirmation Soil Samples – Hydrocarbons
Table SS-25-2:	South Shore Remediation Confirmation Soil Samples – Metals
Table SS-25-3:	South Shore Remediation Confirmation Soil Samples – Polycyclic Aromatic Hydrocarbons (PAHs)
Table SS 25-4:	South Shore Quality Assurance and Quality Control Remediation Soil Samples – Metals

Figures

Figure SS-25-1:	South Shore Conditions Before Remediation
Figure SS-25-2:	South Shore Conditions After Remediation

Table SS-25-1. South Shore Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	South Shore			
		Sample ID	Shore-7-F-C	Shore-11860-F-C	Shore-11861-F-C	Shore-12037-F-C
		Date Sampled	23-Jun-03	29-Jun-04	29-Jun-04	23-Jul-04
		ALS File Number	S9893	U5353R	U5353R	U6364
		Field Screen (ppm)[b]	-	-	-	5
Parameter	**Site Specific**	**Units**	**Analytical Results**			
Extractable Hydrocarbons						
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	310	590
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	590
HEPH[c]	1000	mg/kg	-	-	-	<200

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The aaproved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-4-F-C	Shore-5-F-C	Shore-6-F-C	Shore-8-F-C	Shore-10-F-C	Shore-50-F-C	Shore-51-F-C
				Date Sampled	24-Jun-03	24-Jun-03	24-Jun-03	24-Jun-03	24-Jun-03	19-Jul-03	19-Jul-03
				ALS File Number	S9893	S9893	S9893	S9893	S9893	T1801	T1801
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	563	607	353	403	298	627	586
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	3347	3379	2440	1979	1610	2370	2418
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	487	643	496	1970	1050	500	267
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	2690	3170	3760	4670	2660	2470	1420

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-52-F-C	Shore-54-F-C	Shore-56-F-C	Shore-57-F-C	Shore-58-F-C	Shore-59-F-D	Shore-60-F-C
				Date Sampled	19-Jul-03	19-Jul-03	19-Jul-03	19-Jul-03	19-Jul-03	19-Jul-03	19-Jul-03
				ALS File Number	T1801	T1801	T1801	T1801	T1801	T1801	T1801
				Field Screen Pb (ppm)[b]	287	353	280	203	234	174	282
				Field Screen Zn (ppm)[b]	874	1294	985	288	516	620	1465
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	135	208	225	137	154	<100	484
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	645	1100	991	448	265	273	3150

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-61-F-C	Shore-53-F-Q	Shore-74-F-C	Shore-75-F-C	Shore-76-F-C	Shore-77-F-C	Shore-78-F-D
				Date Sampled	19-Jul-03	19-Jul-03	22-Jul-03	22-Jul-03	23-Jul-03	22-Jul-03	22-Jul-03
				ALS File Number	T1801	T1801	T1888	T1888	T1888	T1888	T1888
				Field Screen Pb (ppm)[b]	212	duplicate of	485	675	271	259	309
				Field Screen Zn (ppm)[b]	816	Shore-61-F-C	1826	4195	826	805	1114
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<100	<100	453	437	121	116	202
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	431	495	5590	4300	365	527	967

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-79-F-D	Shore-80-F-C	Shore-72-F-Q	Shore-81-F-C	Shore-82-F-C	Shore-83-F-C	Shore-85-F-C
				Date Sampled	22-Jul-03	22-Jul-03	22-Jul-03	25-Jul-03	25-Jul-03	25-Jul-03	25-Jul-03
				ALS File Number	T1888	T1888	T1888	T2135r	T2135r	T2135r	T2135r
				Field Screen Pb (ppm)[b]	308	-	duplicate of	210	255	382	271
				Field Screen Zn (ppm)[b]	1308	-	Shore-80-F-C	763	654	1322	1004
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	8.11	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<20	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	<10	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	**1100**	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	2	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	10	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	<4	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	11	-	-	-
Lead	T-Pb	2000	-	mg/kg	279	346	471	127	195	1060	123
Mercury	T-Hg	-	7	mg/kg	-	-	-	<0.05	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	15	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<4	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<10	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	40	-	-	-
Zinc	T-Zn	10000	-	mg/kg	1220	1050	1640	547	970	4160	462

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-86-F-C	Shore-84-F-Q	Shore-87-F-C	Shore-89-F-C	Shore-90-F-C	Shore-96-F-C	Shore-109-F-C
				Date Sampled	25-Jul-03	25-Jul-03	25-Jul-03	29-Jul-03	29-Jul-03	28-Jul-03	03-Aug-03
				ALS File Number	T2135r	T2135r	T2135r	T2239	T2239	T2239	T2587
				Field Screen Pb (ppm)[b]	156	duplicate of	190	487	803	1066	442
				Field Screen Zn (ppm)[b]	272	Shore-86-F-C	760	1747	5172	5568	2691
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<100	214	<200	253	165	1040	159
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	120	812	578	791	1810	4710	912

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-110-F-C	Shore-108-F-Q	Shore-111-F-C	Shore-112-F-C	Shore-114-F-C	Shore-115-F-C	Shore-120-F-C
				Date Sampled	03-Aug-03	03-Aug-03	03-Aug-03	08-Aug-03	13-Aug-03	13-Aug-03	13-Aug-03
				ALS File Number	T2587	T2587	T2587	T2588	T3191	T3191	T3069
				Field Screen Pb (ppm)[b]	844	duplicate of	268	766	1157	641	630
				Field Screen Zn (ppm)[b]	3480	Shore-110-F-C	635	4027	5525	1910	4061
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	-	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	676	717	<100	987	394	543	1030
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	2410	2530	279	3760	2570	1910	8910

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-122-F-C	Shore-124-F-C	Shore-125-F-C	Shore-127-F-C	Shore-142-F-C	Shore-144-F-D	Shore-146-F-C
				Date Sampled	16-Aug-03	13-Aug-03	13-Aug-03	16-Aug-03	18-Aug-03	17-Aug-03	18-Aug-03
				ALS File Number	T3069	T3191	T3191	T3069	T3069	T3069	T3069
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	568	1242	182	527	178	447	691
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	3144	4487	1046	2169	1336	1956	2559
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	8.56	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	<20	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	<10	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	**509**	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	<1	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	3	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	4	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	<4	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	6	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	755	856	236	677	114	256	553
Mercury	T-Hg	-	7	mg/kg	-	-	<0.50	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	<8	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	<10	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	<3	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	<4	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	<10	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	18	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	3640	2930	1180	2350	351	1360	1330

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-143-F-Q	Shore-156-F-C	Shore-157-F-C	Shore-158-F-C	Shore-159-F-C	Cshed-401-F-C	Cshed-402-F-C
				Date Sampled	17-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	12-Sep-03	12-Sep-03
				ALS File Number	T3069	T3069	T3069	T3069	T3069	T4071	T4071
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	duplicate of	-	-	-	-	149	231
				Field Screen Zn (ppm)[b]	Shore-146-F-C	-	-	-	-	1339	2898
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	8.07	-	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	<10	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	**675**	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	<1	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	5	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	6	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	<4	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	12	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	428	369	197	152	282	327	227
Mercury	T-Hg	-	7	mg/kg	-	0.12	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	10	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	<3	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	<4	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	<10	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	30	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	1270	1870	1030	572	1100	2140	3050

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-411-F-C	Shore-429-F-C	Shore-436-F-C	Shore-420-F-Q	Shore-437-F-C	Shore-462-F-D	Shore-466-F-D
				Date Sampled	23-Sep-03	23-Sep-03	07-Oct-03	23-Sep-03	08-Oct-03	19-Oct-03	19-Oct-03
				ALS File Number	T4504	T4900	T5345	T4504	T5345	T5735	T5735
				Field Screen Pb (ppm)[b]	547	664	402	duplicate of	746	317	659
				Field Screen Zn (ppm)[b]	2721	2837	2045	Shore-436-F-Q	2671	1477	4138
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	8.22	-	-	7.91	8.38
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	<30	-	-	<20	<20
Arsenic	T-As	-	12	mg/kg	-	-	<20	-	-	<10	<10
Barium	T-Ba	-	500	mg/kg	-	-	**987**	-	-	**889**	392
Beryllium	T-Be	-	4[d]	mg/kg	-	-	<2	-	-	<1.0	<1.0
Cadmium	T-Cd	-	10	mg/kg	-	-	5	-	-	4	**17.8**
Chromium	T-Cr	-	64	mg/kg	-	-	8	-	-	8.3	6.6
Cobalt	T-Co	-	50[d]	mg/kg	-	-	<6	-	-	<4.0	<4.0
Copper	TCu	-	63	mg/kg	-	-	13	-	-	12.3	22.4
Lead	T-Pb	2000	-	mg/kg	910	1170	411	485	994	300	1790
Mercury	T-Hg	-	7	mg/kg	-	-	<0.05	-	-	<0.050	<0.050
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	<20	-	-	<8.0	<8.0
Nickel	T-Ni	-	50	mg/kg	-	-	<20	-	-	14	11
Selenium	T-Se	-	1	mg/kg	-	-	<4	-	-	<2.0	<2.0
Silver	T-Ag	-	20[d]	mg/kg	-	-	<6	-	-	<4.0	<4.0
Tin	T-Sn	-	50[d]	mg/kg	-	-	<20	-	-	<10	<10
Vanadium	T-V	-	130	mg/kg	-	-	35	-	-	29.9	17.6
Zinc	T-Zn	10000	-	mg/kg	3440	2390	2740	2510	5430	1530	7800

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore						
				Sample ID	Shore-482-F-C	Shore-484-F-C	Shore-485-F-C	Shore-486-F-C	Shore-502-F-C	Shore-503-F-C	Shore-504-F-C
				Date Sampled	20-Oct-03	20-Oct-03	20-Oct-03	20-Oct-03	23-Oct-03	23-Oct-03	23-Oct-03
				ALS File Number	T5735	T5735	T5735	T5735	T5790	T5790	T5790
				Field Screen Pb (ppm)[b]	-	-	-	-	-	-	-
				Field Screen Zn (ppm)[b]	-	-	-	-	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH		-	-	-	-	-	8.6	-	-	-	-
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	<20	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	<10	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	274	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	<1.0	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	5.6	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	<4.0	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	<4.0	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	7.7	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	890	940	620	290	<50	580	120
Mercury	T-Hg	-	7	mg/kg	-	-	<0.050	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	<8.0	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	<10	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	<2.0	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	<4.0	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	<10	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	8.7	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	3980	2300	2260	1510	90.4	1610	754

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-10647-F-C	Shore-10747-F-C	Shore-10775-F-D	Shore-10779-F-D	Shore-10820-F-C	Shore-10849-F-Q
				Date Sampled	13-May-04	13-May-04	31-May-04	23-May-04	24-May-04	24-May-04
				ALS File Number	U3898r	U3969r	U4137	U4484	U3969r	U3969r
				Field Screen Pb (ppm)[b]	-	-	147	336	-	duplicate of
				Field Screen Zn (ppm)[b]	-	-	752	771	-	Shore-10820-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	12.3	-	-	8.37	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	-	-	<20	-
Arsenic	T-As	-	12	mg/kg	-	<10	-	-	<10	-
Barium	T-Ba	-	500	mg/kg	-	467	-	-	**718**	-
Beryllium	T-Be	-	4[d]	mg/kg	-	<1	-	-	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	1.4	-	-	1.4	-
Chromium	T-Cr	-	64	mg/kg	-	6	-	-	5	-
Cobalt	T-Co	-	50[d]	mg/kg	-	<4	-	-	<4	-
Copper	TCu	-	63	mg/kg	-	7	-	-	7	-
Lead	T-Pb	2000	-	mg/kg	577	220	220	680	520	520
Mercury	T-Hg	-	7	mg/kg	-	<0.05	-	-	<0.05	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8	-	-	<8	-
Nickel	T-Ni	-	50	mg/kg	-	<10	-	-	11	-
Selenium	T-Se	-	1	mg/kg	-	<4	-	-	<4	-
Silver	T-Ag	-	20[d]	mg/kg	-	<4	-	-	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	<10	-	-	<10	-
Vanadium	T-V	-	130	mg/kg	-	24	-	-	22	-
Zinc	T-Zn	10000	-	mg/kg	2890	524	526	1190	566	719

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore					
				Sample ID	Shore-10821-F-C	Shore-10947-F-D	Shore-10956-F-D	Shore-11220-F-C	Shore-11221-F-C	Shore-11222-F-C
				Date Sampled	24-May-04	28-May-04	28-May-04	04-Jun-04	04-Jun-04	04-Jun-04
				ALS File Number	U3969r	U4484	U4484	U4269r	U4269r	U4269r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	231	250	-	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	1300	1478	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	8.38	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	<10	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	**989**	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	2.4	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	8	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	<4	-
Copper	TCu	-	63	mg/kg	-	-	-	-	10	-
Lead	T-Pb	2000	-	mg/kg	560	310	210	340	270	300
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	<0.05	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	<8	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	12	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	<4	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	43	-
Zinc	T-Zn	10000	-	mg/kg	861	1740	1510	1010	699	1030

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11223-F-C	Shore-11486-F-Q	Shore-11229-F-C	Shore-11232-F-C	Shore-11303-F-C	Shore-11304-F-C
				Date Sampled	15-Jun-04	15-Jun-04	15-Jun-04	15-Jun-04	31-May-04	31-May-04
				ALS File Number	U4704	U4704	U4704	U4704	U4137	U4137
				Field Screen Pb (ppm)[b]	-	duplicate of	-	-	-	-
				Field Screen Zn (ppm)[b]	-	Shore-11223-F-C	-	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	8.32	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	<20	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	<10	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	**678**	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<1	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	2	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	7	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	<4	-	-	-	-	-
Copper	TCu	-	63	mg/kg	9	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	550	650	230	500	1170	160
Mercury	T-Hg	-	7	mg/kg	<0.05	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<8	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	12	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	<4	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	<4	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	<10	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	30	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	494	415	2340	649	3130	1630

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore					
				Sample ID	Shore-11305-F-C	Shore-11309-F-Q	Shore-11306-F-C	Shore-11307-F-C	Shore-11308-F-C	Shore-11317-F-D
				Date Sampled	31-May-04	31-May-04	31-May-04	31-May-04	31-May-04	08-Jun-04
				ALS File Number	U4137	U4137	U4137	U4137	U4137	U5353r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	duplicate of	-	-	-	62
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	Shore-11305-F-C	-	-	-	435
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	<40
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	<200
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	**706**
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	<1
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	<4
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	8
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	<4
Copper	TCu	-	63	mg/kg	-	-	-	-	-	11
Lead	T-Pb	2000	-	mg/kg	130	170	320	220	270	<100
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	<8
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	11
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	<100
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	<4
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	<20
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	48
Zinc	T-Zn	10000	-	mg/kg	527	486	1640	843	1380	241

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11338-F-D	Shore-11364-F-C	Shore-11366-F-C	Shore-11367-F-C	Shore-11368-F-C	Shore-11369-F-Q
				Date Sampled	09-Jun-04	15-Jun-04	08-Jun-04	08-Jun-04	08-Jun-04	08-Jun-04
				ALS File Number	U4484	U4704	U4484	U4484	U4484	U4484
				Field Screen Pb (ppm)[b]	209	-	-	-	-	duplicate of
				Field Screen Zn (ppm)[b]	1384	-	-	-	-	Shore-11368-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	8.5	-	7.93	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	<20	-	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	<10	-	<10	-
Barium	T-Ba	-	500	mg/kg	-	-	**991**	-	**924**	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	<1	-	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	-	4	-	4.4	-
Chromium	T-Cr	-	64	mg/kg	-	-	7	-	13	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	<4	-	5	-
Copper	TCu	-	63	mg/kg	-	-	14	-	23	-
Lead	T-Pb	2000	-	mg/kg	270	110	310	250	310	210
Mercury	T-Hg	-	7	mg/kg	-	-	<0.05	-	0.057	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	<8	-	<8	-
Nickel	T-Ni	-	50	mg/kg	-	-	13	-	26	-
Selenium	T-Se	-	1	mg/kg	-	-	<4	-	<4	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	<4	-	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	<10	-	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	44	-	66	-
Zinc	T-Zn	10000	-	mg/kg	1290	747	1380	2570	1630	1370

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11470-F-C	Shore-11471-F-C	Shore-11472-F-C	Shore-11473-F-C	Shore-11474-F-C	Shore-11475-F-C
				Date Sampled	15-Jun-04	15-Jun-04	15-Jun-04	15-Jun-04	15-Jun-04	15-Jun-04
				ALS File Number	U4781	U4781	U4781	U4781	U4781	U4781
				Field Screen Pb (ppm)[b]	50	39	66	31	53	67
				Field Screen Zn (ppm)[b]	314	280	263	190	284	309
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	8.51	-	-	-	-	8.46
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	<10	-	-	-	-	<10
Arsenic	T-As	-	12	mg/kg	10	-	-	-	-	9
Barium	T-Ba	-	500	mg/kg	**1090**	-	-	-	-	**813**
Beryllium	T-Be	-	4[d]	mg/kg	<0.5	-	-	-	-	<0.5
Cadmium	T-Cd	-	10	mg/kg	0.61	-	-	-	-	0.53
Chromium	T-Cr	-	64	mg/kg	14	-	-	-	-	11
Cobalt	T-Co	-	50[d]	mg/kg	7	-	-	-	-	6
Copper	TCu	-	63	mg/kg	30	-	-	-	-	25
Lead	T-Pb	2000	-	mg/kg	<50	<50	59	<50	<50	<50
Mercury	T-Hg	-	7	mg/kg	0.116	-	-	-	-	0.099
Molybdenum	T-Mo	-	10[d]	mg/kg	4	-	-	-	-	<4
Nickel	T-Ni	-	50	mg/kg	40	-	-	-	-	33
Selenium	T-Se	-	1	mg/kg	<2	-	-	-	-	<2
Silver	T-Ag	-	20[d]	mg/kg	<2	-	-	-	-	<2
Tin	T-Sn	-	50[d]	mg/kg	<5	-	-	-	-	<5
Vanadium	T-V	-	130	mg/kg	84	-	-	-	-	69
Zinc	T-Zn	10000	-	mg/kg	163	127	180	112	105	139

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11585-F-Q	Shore-11476-F-C	Shore-11485-F-C	Shore-11565-F-D	Shore-11573-F-C	Shore-11575-F-C
				Date Sampled	15-Jun-04	15-Jun-04	15-Jun-04	15-Jun-04	21-Jun-04	21-Jun-04
				ALS File Number	U4781	U4781	U4704	U5353r	U4948	U4948
				Field Screen Pb (ppm)[b]	duplicate of	72	-	141	467	99
				Field Screen Zn (ppm)[b]	Shore-11475-F-C	259	-	174	2149	936
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<50	<50	610	<50	<100	130
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	142	118	3020	69	287	336

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11576-F-C	Shore-11597-F-C	Shore-11630-F-C	Shore-11631-F-C	Shore-11649-F-D	Shore-11669-F-C
				Date Sampled	21-Jun-04	19-Jun-04	22-Jun-04	22-Jun-04	15-Jun-04	25-Jun-04
				ALS File Number	U4948	U4948	U5223	U5223	U5353r	U5050
				Field Screen Pb (ppm)[b]	494	445	55	57	270	-
				Field Screen Zn (ppm)[b]	721	3086	157	189	843	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	250	660	<50	<50	319	180
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	330	3930	82.4	103	1220	467

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore					
				Sample ID	Shore-11670-F-C	Shore-11671-F-C	Shore-11672-F-C	Shore-11676-F-C	Shore-11695-F-C	Shore-11722-F-D
				Date Sampled	25-Jun-04	25-Jun-04	25-Jun-04	26-Jun-04	28-Jun-04	23-Jun-04
				ALS File Number	U5050	U5050	U5050	U5223	U5223	U5050
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	-	-	207	106	244
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	-	-	779	459	1561
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	78	230	450	190	150	232
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	198	1050	694	509	466	1340

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11743-F-C	Shore-11744-F-C	Shore-11746-F-C	Shore-11747-F-C	Shore-11767-F-C	Shore-11768-F-Q
				Date Sampled	15-Jun-04	15-Jun-04	02-Jul-04	02-Jul-04	07-Jul-04	07-Jul-04
				ALS File Number	U5353r	U5353r	U5353r	U5353r	U5615r	U5615r
				Field Screen Pb (ppm)[b]	-	-	-	-	-	duplicate of
				Field Screen Zn (ppm)[b]	-	-	-	-	-	Shore-11767-F-C
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<40	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	<200	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	**805**	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	<4	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	10	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	<4	-	-
Copper	TCu	-	63	mg/kg	-	-	-	17	-	-
Lead	T-Pb	2000	-	mg/kg	<50	<50	380	290	480	520
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	18	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<100	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<20	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	57	-	-
Zinc	T-Zn	10000	-	mg/kg	67.6	101	1880	822	786	1050

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore					
				Sample ID	Shore-11816-F-C	Shore-11817-F-Q	Shore-11818-F-C	Shore-11821-F-C	Shore-11822-F-C	Shore-11854-F-D
				Date Sampled	27-Jun-04	27-Jun-04	27-Jun-04	30-Jun-04	30-Jun-04	02-Jul-04
				ALS File Number	U5223	U5223	U5223	U5353r	U5353r	U5353r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	duplicate of	-	380	262	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	Shore-11816-F-C	-	1719	1006	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	<40
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	<200
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	**513**
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	<1
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	<4
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	11
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	8
Copper	TCu	-	63	mg/kg	-	-	-	-	-	32
Lead	T-Pb	2000	-	mg/kg	<50	<50	<50	228	203	<100
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	<8
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	38
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	<100
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	<4
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	<20
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	82
Zinc	T-Zn	10000	-	mg/kg	96.8	157	63.8	616	610	114

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11860-F-C	Shore-11861-F-C	Shore-11964-F-D	Shore-11987-F-D	Shore-11778-F-Q	Shore-11988-F-D
				Date Sampled	29-Jun-04	29-Jun-04	15-Jul-04	13-Jul-04	13-Jul-04	13-Jul-04
				ALS File Number	U5353r	U5353r	U6440	U5836	U5836	U5836
				Field Screen Pb (ppm)[b]	-	-	-	170	duplicate of	175
				Field Screen Zn (ppm)[b]	-	-	-	299	Shore-11987-F-D	576
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	8.73	8.58	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	<20	<20	-
Arsenic	T-As	-	12	mg/kg	-	-	-	<10	**15**	-
Barium	T-Ba	-	500	mg/kg	-	-	-	192	**608**	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	<1	<1	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	**11.4**	1.4	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	5	12	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	<4	8	-
Copper	TCu	-	63	mg/kg	-	-	-	7	30	-
Lead	T-Pb	2000	-	mg/kg	<200	<200	320	**2600**	140	210
Mercury	T-Hg	-	7	mg/kg	-	-	-	<0.05	0.119	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	<8	<8	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	<10	38	-
Selenium	T-Se	-	1	mg/kg	-	-	-	<4	<4	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	<4	<4	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	<10	<10	-
Vanadium	T-V	-	130	mg/kg	-	-	-	26	86	-
Zinc	T-Zn	10000	-	mg/kg	49.2	134	934	4400	365	424

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	South Shore					
				Sample ID	Shore-11779-F-Q	Shore-11996-F-C	Shore-11997-F-Q	Shore-11998-F-C	Shore-11999-F-Q	Shore-12000-F-C
				Date Sampled	13-Jul-04	15-Jul-04	15-Jul-04	15-Jul-04	15-Jul-04	15-Jul-04
				ALS File Number	U5830	U6440	U6440	U6440	U6440	U6440
				Field Screen Pb (ppm)[b]	duplicate of	515	duplicate of	-	duplicate of	-
				Field Screen Zn (ppm)[b]	Shore-11988-F-D	2405	Shore-11996-F-C	-	Shore-11998-F-C	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<100	<100	<100	<100	280	<100
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	207	36	39	51	363	179

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
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"-" = Analysis not conducted, or no guideline.

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b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore					
				Sample ID	Shore-12001-F-C	Shore-12002-F-C	Shore-12003-F-C	Shore-12037-F-C	Shore-12067-W-C	Shore-12071-W-D
				Date Sampled	18-Jul-04	18-Jul-04	18-Jul-04	23-Jul-04	26-Jul-04	26-Jul-04
				ALS File Number	U6530r	U6530r	U6530r	U6364	U6530r	U6530r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	773	693	896	250	1248	540
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	1208	1306	1530	1652	2064	1074
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**					
pH		-	-	-	-	-	-	-	-	-
Total Metals										
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	279	244	314	<100	537	295
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	331	321	403	462	760	473

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-2. South Shore Area Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	South Shore		
				Sample ID	Shore-12072-W-C	Shore-12073-W-C	Shore-12074-W-C
				Date Sampled	28-Jul-04	28-Jul-04	28-Jul-04
				ALS File Number	U6530r	U6530r	U6530r
		Polaris Mine Soil Quality Remediation Objectives[a]		Field Screen Pb (ppm)[b]	194	293	-
				Field Screen Zn (ppm)[b]	590	1290	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**		
pH		-	-	-	-	-	-
Total Metals							
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-
Copper	TCu	-	63	mg/kg	-	-	-
Lead	T-Pb	2000	-	mg/kg	<50	94	93
Mercury	T-Hg	-	7	mg/kg	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-
Zinc	T-Zn	10000	-	mg/kg	134	298	361

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS-25-3. South Shore Area Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons (PAHs)

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	South Shore
		Sample ID	Shore-12037-F-C
		Date Sampled	7/23/2004
		ALS File Number	U6364
		Field Screen (ppm)[b]	5
Parameter	**CEQG[b]**	**Units**	**Analytical Results**
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	-	mg/kg	<0.06
Acenaphthylene	-	mg/kg	<0.05
Anthracene	-	mg/kg	<0.05
Benz(a)anthracene	1[c]	mg/kg	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05
Benzo(b)fluoranthene	1[c]	mg/kg	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05
Benzo(k)fluoranthene	1[c]	mg/kg	<0.05
Chrysene	-	mg/kg	<0.05
Dibenz(a,h)anthracene	1[c]	mg/kg	<0.05
Fluoranthene	-	mg/kg	<0.05
Fluorene	-	mg/kg	0.128
Indeno(1,2,3,-c,d)pyrene	1[c]	mg/kg	<0.05
Napthalene	0.6	mg/kg	0.177
Phenanthrene	5[c]	mg/kg	0.074
Pyrene	10[c]	mg/kg	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore							
				Sample ID	Shore-5-F-C	Shore-6-F	Shore-55-F	Shore-61-F-C	Shore-71-W-D	Shore-77-F	Shore-80-F-C	Shore-84-F-Q
				Duplicate ID	Shore 45-F-Q	QC# 342557	QC# 346418	Shore-53-F-Q	Shore-107-W-Q	QC# 346792	Shore-72-F-Q	QC# 347684
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**							
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350		607	-	-	-	4925	-	-	-
Duplicate Result	mg/kg	70	350		530	-	-	-	3635	-	-	-
RpD	%				13%				30%			
Zinc (Zn)												
Sample Result	mg/kg	150	750		3379	-	-	-	53208	-	-	-
Duplicate Result	mg/kg	150	750		3318	-	-	-	40596	-	-	-
RpD	%				2%				27%			
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		-	-	-	<100	-	-	346	-
Duplicate Result	mg/kg	100	500		-	-	-	<100	-	-	471	-
RpD	%							na			na	
Zinc (Zn)												
Sample Result	mg/kg	3	15		-	-	-	431	-	-	1050	-
Duplicate Result	mg/kg	3	15		-	-	-	495	-	-	1640	-
RpD	%							14%			44%	
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		-	496	2040	-	-	166	-	214
Duplicate Result	mg/kg	100	500		-	1360	1290	-	-	143	-	201
RpD	%					na	45%			na		na
Zinc (Zn)												
Sample Result	mg/kg	3	15		-	3760	6160	-	-	527	-	812
Duplicate Result	mg/kg	3	15		-	4850	4020	-	-	568	-	779
RpD	%					25%	42%			7%		4%

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore							
				Sample ID	Shore-86-F-C	Shore-110-F-C	Shore-122-I-C	Shore-126-F-C	Shore-127-F-C	Shore-143-F-C	Shore-159-F-C	Shore-418-F-C
				Duplicate ID	Shore-84-F-Q	Shore-108-F-Q	QC# 351114	Shore 31-F-Q	Shore 32-F-Q	Shore 146-F-Q	QC# 351116	Shore 43-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**							
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350		156	-	-	857	527	-	-	720
Duplicate Result	mg/kg	70	350		273	-	-	727	843	-	-	446
RpD	%				na			16%	46%			0
Zinc (Zn)												
Sample Result	mg/kg	150	750		272	-	-	4948	2169	-	-	10133
Duplicate Result	mg/kg	150	750		845	-	-	4230	2441	-	-	5775
RpD	%				na			16%	12%			1
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		<100	676	-	-	-	428	-	-
Duplicate Result	mg/kg	100	500		214	717	-	-	-	553	-	-
RpD	%				na	6%				na		
Zinc (Zn)												
Sample Result	mg/kg	3	15		120	2410	-	-	-	1270	-	-
Duplicate Result	mg/kg	3	15		812	2530	-	-	-	1330	-	-
RpD	%				**148%**	5%				5%		
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500		-	-	755	-	-	-	282	-
Duplicate Result	mg/kg	100	500		-	-	932	-	-	-	283	-
RpD	%						21%				na	
Zinc (Zn)												
Sample Result	mg/kg	3	15		-	-	3640	-	-	-	1100	-
Duplicate Result	mg/kg	3	15		-	-	3310	-	-	-	1120	-
RpD	%						9%				0	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-419-F-C	Shore-436-F-C	Shore482-F-C	Shore-10204-BH-C	Shore-10205-BH-C	Shore-10779-F-D	Shore-10820-F-C
				Duplicate ID	Shore 44-F-Q	Shore-420-F-Q	QC# 361123	Shore-10216-BH-Q	Shore-10217-BH-Q	QC# 390728	Shore-10849-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350		1083	-	-	43	373	-	-
Duplicate Result	mg/kg	70	350		494	-	-	57	459	-	-
RpD	%				**75%**			na	21%		
Zinc (Zn)											
Sample Result	mg/kg	150	750		7514	-	-	336	1437	-	-
Duplicate Result	mg/kg	150	750		6527	-	-	248	1481	-	-
RpD	%				14%			na	3%		
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	411	-	-	-	-	520
Duplicate Result	mg/kg	100	500		-	485	-	-	-	-	520
RpD	%					na					0
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	2740	-	-	-	-	566
Duplicate Result	mg/kg	3	15		-	2510	-	-	-	-	719
RpD	%					9%					0
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	890	-	-	680	-
Duplicate Result	mg/kg	100	500		-	-	1070	-	-	790	-
RpD	%						18%			0	
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	3980	-	-	1190	-
Duplicate Result	mg/kg	3	15		-	-	4450	-	-	1110	-
RpD	%						11%			0	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-11220-F-C	Shore-11223-F-C	Shore-11229-F-C	Shore-11303-F-C	Shore-11305-F-C	Shore-11317-F-D	Shore-11339-F-D
				Duplicate ID	QC# 389862	Shore-11486-F-Q	QC# 391524	QC# 389243	Shore-11309-F-Q	QC# 394459	Shore-10491-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350		-	-	-	-	-	-	240
Duplicate Result	mg/kg	70	350		-	-	-	-	-	-	227
RpD	%										na
Zinc (Zn)											
Sample Result	mg/kg	150	750		-	-	-	-	-	-	1423
Duplicate Result	mg/kg	150	750		-	-	-	-	-	-	1807
RpD	%										0
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	550	-	-	130	-	-
Duplicate Result	mg/kg	100	500		-	650	-	-	170	-	-
RpD	%					17%			na		
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	494	-	-	527	-	-
Duplicate Result	mg/kg	3	15		-	415	-	-	486	-	-
RpD	%					17%			8%		
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		340	-	230	1170	-	<100	-
Duplicate Result	mg/kg	100	500		340	-	220	1530	-	<100	-
RpD	%				na		na	0		na	
Zinc (Zn)											
Sample Result	mg/kg	3	15		1010	-	2340	3130	-	241	-
Duplicate Result	mg/kg	3	15		925	-	2180	2690	-	547	-
RpD	%				9%		0	0		na	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-11343-F-D	Shore-11353-F-D	Shore-11368-F-C	Shore-11400-F-D	Shore-11402-F-D	Shore-11475-F-C	Shore-11576-F-C
				Duplicate ID	Shore-10492-F-Q	Shore-10493-F-Q	Shore-11369-F-Q	Shore-10494-F-Q	Shore-11750-F-Q	Shore-11585-F-Q	QC# 392656
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350		866	195	-	6697	356	-	-
Duplicate Result	mg/kg	70	350		1110	246	-	8796	357	-	-
RpD	%				25%	na		0	0%		
Zinc (Zn)											
Sample Result	mg/kg	150	750		22435	351	-	28062	637	-	-
Duplicate Result	mg/kg	150	750		22790	349	-	36829	543	-	-
RpD	%				2%	na		0	na		
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	310	-	-	<50	-
Duplicate Result	mg/kg	100	500		-	-	210	-	-	<50	-
RpD	%						na			na	
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	1630	-	-	139	-
Duplicate Result	mg/kg	3	15		-	-	1370	-	-	142	-
RpD	%						17%			2%	
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	-	-	-	-	250
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	160
RpD	%										na
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	-	-	-	-	330
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-	203
RpD	%										na

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-11641-F-D	Shore-11649-F-D	Shore-11659-F-D	Shore-11670-F-C	Shore-11676-F-C	Shore-11767-F-C	Shore-11816-F-C
				Duplicate ID	Shore-11713-F-Q	Shore-11715-F-Q	Shore-11717-F-Q	QC# 393170	QC# 393917	Shore-11768-F-Q	Shore-11817-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350		69	270	220	-	190	-	-
Duplicate Result	mg/kg	70	350		94	351	246	-	210	-	-
RpD	%				na	na	na		na		
Zinc (Zn)											
Sample Result	mg/kg	150	750		491	843	716	-	509	-	-
Duplicate Result	mg/kg	150	750		367	1122	824	-	603	-	-
RpD	%				na	0	na		na		
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	-	-	-	480	<50
Duplicate Result	mg/kg	100	500		-	-	-	-	-	520	<50
RpD	%									na	na
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	-	-	-	786	97
Duplicate Result	mg/kg	3	15		-	-	-	-	-	1050	157
RpD	%									29%	0
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	-	78	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	77	-	-	-
RpD	%							na			
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	-	198	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	229	-	-	-
RpD	%							na			

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-11821-F-C	Shore-11987-F-D	Shore-11988-F-D	Shore-11996-F-C	Shore-11997-F-Q	Shore-11998-F-C	Shore-12002-F-C
				Duplicate ID	QC# 394458	Shore-11778-F-Q	Shore-11779-F-Q	Shore-11997-F-Q	QC# 399152	Shore-11999-F-Q	QC# 399318
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350		-	-	-	-	-	-	-
Duplicate Result	mg/kg	70	350		-	-	-	-	-	-	-
RpD	%										
Zinc (Zn)											
Sample Result	mg/kg	150	750		-	-	-	-	-	-	-
Duplicate Result	mg/kg	150	750		-	-	-	-	-	-	-
RpD	%										
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	2600	210	<100	-	<100	-
Duplicate Result	mg/kg	100	500		-	140	<100	<100	-	280	-
RpD	%					na	na	na		na	
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	4400	424	36	-	51	-
Duplicate Result	mg/kg	3	15		-	365	207	39	-	363	-
RpD	%					**169%**	**69%**	6%		**151%**	
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		228	-	-	-	<100	-	244
Duplicate Result	mg/kg	100	500		314	-	-	-	<100	-	246
RpD	%				na				na		na
Zinc (Zn)											
Sample Result	mg/kg	3	15		616	-	-	-	39	-	321
Duplicate Result	mg/kg	3	15		653	-	-	-	38	-	321
RpD	%				na				na		na

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore						
				Sample ID	Shore-12013-S-D	Shore-12014-S-D	Shore-12015-S-D	Shore-12016-S-D	Shore-12017-S-D	Shore-12018-S-D	Shore-12019-S-D
				Duplicate ID	Shore-12308-S-Q	Shore-12309-S-Q	Shore-12310-S-Q	Shore-12311-S-Q	Shore-12312-S-Q	Shore-12313-S-Q	Shore-12314-S-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**						
On Site Field Screening Duplicates											
Lead (Pb)											
Sample Result	mg/kg	70	350		5544	9553	1748	3408	1027	2093	3702
Duplicate Result	mg/kg	70	350		5309	9221	1675	3600	883	1966	4679
RpD	%				0	0	4%	5%	15%	6%	0
Zinc (Zn)											
Sample Result	mg/kg	150	750		15801	28170	5867	18193	3276	5249	7894
Duplicate Result	mg/kg	150	750		15546	27128	5381	18453	3023	4838	9938
RpD	%				0	0	9%	1%	8%	8%	0
Analytical Laboratory Duplicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-
RpD	%										
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-	-
RpD	%										
Analytical Laboratory Replicates											
Lead (Pb)											
Sample Result	mg/kg	100	500		-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-	-
RpD	%										
Zinc (Zn)											
Sample Result	mg/kg	3	15		-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-	-
RpD	%										

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

Table SS 25-4. South Shore Area Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	South Shore					
				Sample ID	Shore-12020-S-D	Shore-12067-W-C	Shore-12068-W-C	Shore-12069-W-C	Shore-12070-W-C	Shore-12071-W-D
				Duplicate ID	Shore-12315-S-Q	Shore-12332-W-Q	Shore-12331-W-Q	Shore-12333-W-Q	Shore-12330-W-Q	Shore-12334-W-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**					
On Site Field Screening Duplicates										
Lead (Pb)										
Sample Result	mg/kg	70	350		2242	1248	2854	988	5756	540
Duplicate Result	mg/kg	70	350		2260	1404	3338	1168	4778	846
RpD	%				0	0	16%	17%	19%	44%
Zinc (Zn)										
Sample Result	mg/kg	150	750		4594	2064	6241	2061	8968	1074
Duplicate Result	mg/kg	150	750		4946	2354	6160	2239	7451	1631
RpD	%				0	0	1%	8%	18%	41%
Analytical Laboratory Duplicates										
Lead (Pb)										
Sample Result	mg/kg	100	500		-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-
RpD	%									
Zinc (Zn)										
Sample Result	mg/kg	3	15		-	-	-	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-
RpD	%									
Analytical Laboratory Replicates										
Lead (Pb)										
Sample Result	mg/kg	100	500		-	-	-	-	-	-
Duplicate Result	mg/kg	100	500		-	-	-	-	-	-
RpD	%									
Zinc (Zn)										
Sample Result	mg/kg	3	15		-	-	-	-	-	-
Duplicate Result	mg/kg	3	15		-	-	-	-	-	-
RpD	%									

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na *RpD value is not applicable because one or both results are less than the PQL.*

RpD *Relative Percent Difference = (Difference/Average)*100.*

PQL *Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL *Method Detection Limit of analysis.*

BH-7
SS 13
SS TL1
TP-207
TP-4
TP-18
BH-6
TP-12
BH-8
TP-38
TP-3
TP-208
TP-2
TP-20
SS20-6
SS20-5
SS 21
TP-1
BH-10
TP-19
SS 12
TP-21
SS 14
TP-37
TP-26
TP-209
TP-36
BH-9
SS 6
TP-25
TP-39
TP-151
TP-35
TP-23
SS 22
TP-24
TP-150
TP-34
TP-149
SS TL3
TP-40
TP-27
SS 23
SS 28
TP-33
TP-148
TP-41
SS TL5
SHORELINE
TP-147
TP-32
TP-155
SS 26
TP-42
TP-154
TP-146
TP-28
TP-31
TP-29
TP-145
TP-30
TP-144
TP-152
TP-143
TP-153
SS FW-B
F-16
SS FW-A
F-17
FSD-2
F-15
F-4
FSD-1
F-3
F-14
TP-43
F-5

500 600 700 800
1300 1200 1100 1000 900

C R O Z I E R S T R A I T

N

0 5 10 20 30 Metres
SCALE 1:750

KEY PLAN
N.T.S.

N O R T H B A Y
TO FRUSTRATION LAKE
TO GARROW LAKE
C R O Z I E R S T R A I T
P O L A R I S B A Y
AREA OF DETAIL
2000N
1000N
100E
2000E

LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)
- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)
- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

SOURCE OF DRAWING:
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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

SOUTH SHORE CONDITIONS BEFORE REMEDIATION

Gartner Lee

FIGURE NO. SS-25-1

Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
Shore-4-F-C	487	2690
Shore-5-F-C	643	3170
Shore-6-F-C	496	3760
Shore-8-F-C	1970	4670
Shore-10-F-C	1050	2660
Shore-50-F-C	500	2470
Shore-51-F-C	267	1420
Shore-52-F-C	135	645
Shore-54-F-C	208	1100
Shore-56-F-C	225	991
Shore-57-F-C	137	448
Shore-58-F-C	154	265
Shore-59-F-D	<100	273
Shore-60-F-C	484	3150
Shore-61-F-C	<100	431
Shore-53-F-Q duplicate of Shore-61-F-C	<100	495
Shore-74-F-C	453	5590
Shore-75-F-C	437	4300
Shore-76-F-C	121	365
Shore-77-F-C	116	527
Shore-78-F-D	202	967
Shore-79-F-D	279	1220
Shore-80-F-C	346	1050
Shore-72-F-Q duplicate of Shore-80-F-C	471	1640
Shore-81-F-C	127	547
Shore-82-F-C	195	970
Shore-83-F-C	1060	4160
Shore-85-F-C	123	462
Shore-86-F-C	<100	120
Shore-84-F-Q duplicate of Shore-86-F-C	214	812
Shore-87-F-C	<200	578
Shore-89-F-C	253	791
Shore-90-F-C	165	1810
Shore-96-F-C	1040	4710
Shore-109-F-C	159	912
Shore-110-F-C	676	2410
Shore-108-F-Q duplicate of Shore-110-F-C	717	2530
Shore-111-F-C	<100	279
Shore-112-F-C	987	3760
Shore-114-F-C	394	2570
Shore-115-F-C	543	1910
Shore-120-F-C	1030	8910
Shore-122-F-C	755	3640
Shore-124-F-C	856	2930
Shore-125-F-C	236	1180
Shore-127-F-C	677	2350
Shore-142-F-C	114	351
Shore-144-F-D	256	1360
Shore-146-F-C	553	1330
Shore-143-F-Q duplicate of Shore-146-F-C	428	1270
Shore-156-F-C	369	1870
Shore-157-F-C	197	1030
Shore-158-F-C	152	572
Shore-159-F-C	282	1100
Cshed-401-F-C	327	2140
Cshed-402-F-C	227	3050
Shore-411-F-C	910	3440
Shore-429-F-C	1170	2390
Shore-436-F-C	411	2740
Shore-420-F-Q duplicate of Shore-436-F-C	485	2510
Shore-437-F-C	994	5430
Shore-462-F-D	300	1530
Shore-466-F-D	1790	7800
Shore-482-F-C	890	3980
Shore-484-F-C	940	2300
Shore-485-F-C	620	2260
Shore-486-F-C	290	1510
Shore-502-F-C	<50	90.4
Shore-503-F-C	580	1610
Shore-504-F-C	120	754
Shore-10647-F-C	577	2890
Shore-10747-F-C	220	524
Shore-10775-F-D	220	526
Shore-10779-F-D	680	1190
Shore-10820-F-C	520	566
Shore-10849-F-Q duplicate of Shore-10820-F-C	520	719
Shore-10821-F-C	560	861
Shore-10947-F-D	310	1740
Shore-10956-F-D	210	1510
Shore-11220-F-C	340	1010
Shore-11221-F-C	270	699
Shore-11222-F-C	300	1030
Shore-11223-F-C	550	494
Shore-11486-F-Q duplicate of Shore-11223-F-C	650	415
Shore-11229-F-C	230	2340
Shore-11232-F-C	500	649
Shore-11303-F-C	1170	3130
Shore-11304-F-C	160	1630
Shore-11305-F-C	130	527
Shore-11309-F-Q duplicate of Shore-11305-F-C	170	486
Shore-11306-F-C	320	1640
Shore-11307-F-C	220	843
Shore-11308-F-C	270	1380
Shore-11317-F-D	<100	241
Shore-11338-F-D	270	1290
Shore-11364-F-C	110	747
Shore-11366-F-C	310	1380
Shore-11367-F-C	250	2570
Shore-11368-F-C	310	1630
Shore-11369-F-Q duplicate of Shore-11368-F-C	210	1370
Shore-11470-F-C	<50	163
Shore-11471-F-C	<50	127
Shore-11472-F-C	59	180
Shore-11473-F-C	<50	112
Shore-11474-F-C	<50	105
Shore-11475-F-C	<50	139
Shore-11585-F-Q duplicate of Shore-11475-F-C	<50	142
Shore-11476-F-C	<50	118
Shore-11485-F-C	610	3020
Shore-11565-F-D	<50	69
Shore-11573-F-C	<100	287
Shore-11575-F-C	130	336
Shore-11576-F-C	250	330
Shore-11597-F-C	660	3930
Shore-11630-F-C	<50	82.4
Shore-11631-F-C	<50	103
Shore-11649-F-D	319	1220
Shore-11669-F-C	180	467
Shore-11670-F-C	78	198
Shore-11671-F-C	230	1050
Shore-11672-F-C	450	694
Shore-11676-F-C	190	509
Shore-11695-F-C	150	466
Shore-11722-F-D	232	1340
Shore-11743-F-C	<50	67.6
Shore-11744-F-C	<50	101
Shore-11746-F-C	380	1880
Shore-11747-F-C	290	822
Shore-11767-F-C	480	786
Shore-11768-F-Q duplicate of Shore-11767-F-C	520	1050
Shore-11816-F-C	<50	96.8
Shore-11817-F-Q duplicate of Shore-11816-F-C	<50	157
Shore-11818-F-C	<50	63.8
Shore-11821-F-C	228	616
Shore-11822-F-C	203	610
Shore-11854-F-D	<100	114
Shore-11860-F-C	<200	49.2
Shore-11861-F-C	<200	134
Shore-11964-F-D	320	934
Shore-11987-F-D	**2600**	4400
Shore-11778-F-Q duplicate of Shore-11987-F-D	140	365
Shore-11988-F-D	210	424
Shore-11779-F-Q duplicate of Shore-11988-F-D	<100	207
Shore-11996-F-C	<100	36.3
Shore-11997-F-Q duplicate of Shore-11996-F-C	<100	38.7
Shore-11998-F-C	<100	50.9
Shore-11999-F-Q duplicate of Shore-11998-F-C	280	363
Shore-12000-F-C	<100	179
Shore-12001-F-C	279	331
Shore-12002-F-C	244	321
Shore-12003-F-C	314	403
Shore-12037-F-C	<100	462
Shore-12067-W-C	537	760
Shore-12071-W-D	295	473
Shore-12072-W-C	<50	134
Shore-12073-W-C	94	298
Shore-12074-W-C	93	361

Confirmation Sample ID	EPH C10-C19 mg/kg	EPH C19-C32 mg/kg
Shore-7-F-C	<200	<200
Shore-11860-F-C	<200	<200
Shore-11861-F-C	310	<200
Shore-12037-F-C	590	<200

Bold — **Concentration greater than or equal to the Polaris Mine SQROs**

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg

REFER TO JUNE 10/05 CLOSE-OUT REPORT: DOCK AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: BARGE AREA

REFER TO DEC. 31/03 CLOSE-OUT REPORT: CONCENTRATE STORAGE SHED AREA

REFER TO JUNE 10/05 CLOSE-OUT REPORT: FOLDAWAY BUILDINGS

C R O Z I E R S T R A I T

N O R T H B A Y

P O L A R I S B A Y

TO FRUSTRATION LAKE

TO GARROW LAKE

AREA OF DETAIL

KEY PLAN
N.T.S.

0 5 10 20 30 Metres

SCALE 1:750

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

ESP–7–I–D
- AREA
- SAMPLE ID
- TYPE: C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA; WALL–5 SAMPLES ALONG 25m OF WALL; D= DISCRETE SAMPLE; Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
- LOCATION: F= FLOOR SAMPLE; I= INTERMEDIATE FLOOR SAMPLE; W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- *EPH – EXTRACTABLE PETROLEUM HYDROCARBONS
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

SOURCE OF DRAWING:

-

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

SOUTH SHORE CONDITIONS AFTER REMEDIATION

Gartner Lee

FIGURE NO. SS-25-2

Appendix J

North Shore

June 10, 2005

Mr. Bruce Donald
Teck Cominco Limited
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: 40137 – Polaris Mine Operations Contaminated Soil Remediation
Close Out Report: North Shore

BACKGROUND

The North Shore area (shown as Area 26 on Figure 1: *Contaminated Soils Remediation Progress Plan, December 31, 2003* and on Figure 2: *Contaminated Soils Remediation Progress Plan, December 31, 2004*) is located north of the sewer line and dock along Crozier Strait. The area was bound by the sewage line to the south, the exploration stockpile to the north and the firehall and main portal to the east.

The North Shore area housed a temporary shop, an ore stockpile and contained part of the berthing lagoon excavated to float the Process Barge into place during the construction of the mine. The temporary shop was located in front of the main portal, and was used to service equipment during the development of the underground workings. A cofferdam was constructed across the entrance to the lagoon, the sea water was pumped out and the excavation backfilled once the Process Barge was in place. Rock obtained from the mine workings was used to backfill the berthing lagoon and to build up the shoreline during the construction and to repair eroded areas during the operation of the mine.

The Environmental Site Assessment (ESA) conducted in 1999 and 2000 identified metal contamination at the North Shore. Three (3) surface samples were collected, one (1) test pit excavated and three (3) boreholes drilled during the ESA. The sample results indicated that elevated metal concentrations were present from surface up to a depth of at least 1.5 m in the backfilled areas. Metals contamination was observed in boreholes and test pit samples. No indication of hydrocarbon contamination was encountered during the ESA. Figure NS-26-01: *North Shore Conditions Before Remediation* illustrates the original topography of the area as well as the sample results from the ESA.

METHODOLOGY

Delineation

Between July 6, 2003 and July 8, 2003, the preliminary boundary of the area to be remediated, identified in the ESA as an "Area of Concern" was further delineated for excavation through the collection and analysis of field screening samples from twenty six (26) boreholes advanced with an air rotary quarry drill. Gartner Lee Limited (GLL) sampled the soil in accordance with standard GLL and Teck Cominco Limited (TCL) sampling procedures and protocols. Three hundred fifty nine (359) composite samples were collected from the boreholes. Each hole was drilled until bedrock was encountered; depths ranged from 1.0 m to 9.5 m and composite soil samples were collected over 0.5 m intervals. The soil samples were collected from the drill returns that accumulated at the mouth of the borehole. Following the collection of each sample the surface surrounding the borehole was cleared of the drill cuttings.

The visual appearance, odour of the soil and field screening measurements obtained from the borehole samples were used to delineate the area to be excavated. Based on the results of the field screening sampling, GLL modified the boundaries of the area to be remediated and directed excavation. The field screening measurements for hydrocarbons were obtained using a portable photo-ionization detector (PID) to measure the concentrations of organic vapours in the headspace of the sample bags. Metals concentrations were analysed using a Niton portable X-Ray Fluorescence (XRF) elemental analyzer. Field screening results from the drilling indicated that both metal and hydrocarbon contamination was present in sub-areas at depths ranging from 1.0 m to 4.5 m. No hydrocarbon contamination was encountered within 25 m of the shoreline.

Excavation

The excavation of the North Shore area started in August 2003 and it was completed in July 2004. In 2003, excavation of metal contaminated soil commenced adjacent to the shoreline. A berm, approximately 10 m wide was left intact between the ocean and the excavation to limit the interaction with the foreshore environment. The berm provided protection from the ocean flooding the worksite as well as protection from the water washing fine sand and silt into the marine environment. Total suspended solids (TSS) levels were monitored daily during periods of work in the foreshore along the shoreline at predetermined stations in accordance with approved site procedures and protocols.

The excavation was left open over the winter months and work recommenced in the spring of 2004. Removal of the berm took place in July 2004 while ice still bound the marine foreshore and interaction with the marine foreshore was minimal.

To direct the excavation activities, soil samples were collected across the excavation area in accordance with standard GLL and TCL sampling procedures and protocols. Field screening using the PID for hydrocarbons and the XRF analyzer for Lead and Zinc was used to determine where additional excavation was required to meet the Site Quality Remediation Objectives (SQRO). Excavation of the North Shore was completed on July 10, 2004. The limits of the excavation are shown on Figure NS-26-02: *North Shore Conditions After Remediation*. This material was disposed of in the underground mine working in accordance with regulatory approvals.

Confirmation Sampling

Upon receipt of field screening results that indicated that the soil remaining in the excavation would meet the SQROs confirmation soil samples were collected. The excavation area was sub divided into individual composite sampling areas approximately 25 m x 25 m or less as required to cover the area to be sampled. Wall samples were composited over a length of 25 m on the wall of the excavation. Composite samples were created by collecting four or five evenly spaced allocates of soil with in the individual composite sample area. A single allocate of soil from a specific point is a discrete sample.

The soil samples were collected at the excavation limits and submitted to ALS Environmental (ALS) for Extractable Petroleum Hydrocarbons (EPH), Polycyclic Aromatic Hydrocarbons (PAH) and metals. Additional excavation was undertaken in areas where the laboratory analytical results did not meet the Soil Quality Remediation Objectives (SQROs) and additional confirmatory samples were taken upon completion of excavation. Upon receipt of analytical results that met the SQROs the final excavation limits were surveyed.

ANALYTICAL RESULTS

Analytical laboratory results for EPH, metals and PAH are summarised in Tables NS-26-1, NS-26-2 and NS-26-3 along with the approved Polaris Mine SQRO's for petroleum hydrocarbons and metals. A total of thirty eight (38) hydrocarbon remediation confirmation samples were submitted from the North Shore area: twenty four (24) composite floor samples, seven (7) discrete samples, and seven (7) quality assurance quality control (QA/QC) samples. Of the metals remediation confirmation samples there were fifty four (54) confirmation samples submitted: thirty four (34) composite floor samples, thirteen (13) discrete samples, two (2) composite wall samples, and five (5) quality assurance quality control (QA/QC) samples. The soil quality results and lateral limits of the excavation are shown on Figure NS-26-2.

Quality Assurance/Quality Control (QA/QC)

Relative percent differences have been calculated and compiled in Table NS-26-4 for EPH and Table NS-26-5 for Lead and Zinc. There are a total of seven (7) analytical laboratory duplicates and four (4) analytical laboratory duplicates for EPH. Of the metals, there are twenty three (23) onsite field screened duplicates, nine (9) analytical laboratory duplicates, and six (6) analytical laboratory replicates for a total forty nine (49) QA/QC samples.

Forty seven (47) of the sample results and their duplicate/replicate results returned RpDs below the practical quantitation limit (PQL), in which case the RpD value has been identified as "na" (not applicable), or returned acceptable RpDs, below the site specific remediation protocol of 50%. Two analytical laboratory duplicates returned RpDs greater than the objective for Lead. The variance between the sample and its duplicate is considered indicative of sample heterogeneity, especially at low concentrations of Lead.

Polaris Mine Soil Quality Remediation Objectives

Twenty four (24) hydrocarbon remediation confirmation composite samples and thirty six (36) metal remediation confirmation composite samples were collected across the floor and the wall of the excavation. All of the remediation confirmation composite samples returned results below the Polaris Mines SQRO's for EPH. Two (2) remediation confirmation composite samples returned results above the Polaris Mine SQRO's for Lead and/or Zinc. Shore-10135-F-C had a Lead concentration of 2320 mg/kg and Shore-10588-F-C had a Lead concentration of 2,140 mg/kg and a Zinc concentration of 10,700 mg/kg. The exceedances are less than two times the SQRO. The SQRO's for Lead and Zinc are 2,000 mg/kg and 10,000 mg/kg respectively. The approved site-specific remedial objectives allow for minor exceedances in a small percentage of the confirmatory sample area, as long as the concentration is less than twice the remedial target.

Discrete samples were collected in addition to the composite samples to discern the homogeneity of the sample areas represented by the composite samples. The results are shown on the tables below and generally confirm that there is reasonable homogeneity within the sample areas with the exception of EPH C_{19}-C_{32} and Zinc concentrations in sample Shore-10800-F-D.

Summary of Discrete Hydrocarbon Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	EPH_{10-19} (mg/kg)	EPH_{19-32} (mg/kg)	Discrete Sample ID	EPH_{10-19} (mg/kg)	EPH_{19-32} (mg/kg)
Shore-10051-F-C	<200	<200	Shore-10042-F-D	<200	<200
Shore-10082-F-C	<200	<200	Shore-10073-F-D	<200	<200
Shore-10080-F-C	<200	<200	Shore-10076-F-D	220	<200
Shore-10080-F-C	<200	<200	Shore-10079-F-D	<200	<200
Shore-10846-F-C	640	490	Shore-10794-F-D	370	460
Shore-10845-F-C	940	370	Shore-10800-F-D	**1180**	**1010**

Summary of Discrete Metals Sample Results Compared to Corresponding Composite Sample Results

Composite Sample ID	Lead (mg/kg)	Zinc (mg/kg)	Discrete Sample ID	Lead (mg/kg)	Zinc (mg/kg)
Shore-10051-F-C	<150	19	Shore-10042-F-D	<150	31
Shore-10082-F-C	<150	16	Shore-10073-F-D	<150	9
Shore-10080-F-C	<150	8	Shore-10076-F-D	<150	7
Shore-10080-F-C	<150	8	Shore-10079-F-D	<150	7
Shore-10134-F-C	<150	11	Shore-10116-F-D	160	623
Shore-10846-F-C	<100	153	Shore-10794-F-D	<100	72
Shore-10845-F-C	140	387	Shore-10800-F-D	230	1190

Generic Federal Soil Quality Guidelines for Parkland Land Use

Eight (8) hydrocarbon samples were analysed for polycyclic aromatic hydrocarbons (PAH) and eight (8) metal samples were analyzed for total metals. The PAH results were below the generic Canadian Council of Ministers of Environment (CCME) Canadian Environmental Quality Guideline (CEQG) for Parkland Land use. Three confirmation samples returned Barium concentrations greater than the CCME CEQG for Parkland Land use of 500 mg/kg for Barium in soil. Barium concentrations in the samples analyzed from the North Shore ranged from 286 mg/kg to 727 mg/kg. The CCME recognizes that local geological conditions may result in elevated background levels of metals above the guidelines.

Barium is a common mineral associated with lead sulphides, and it is found in cavities in limestone and dolostone. Soil samples collected during the 2004 vegetation sampling program at Polaris, as documented in the November 24, 2004 Memorandum *2004 Vegetation Sampling Results,* are considered to be representative of background conditions. Samples were collected at the following intervals surface to 0.01 m, 0.01 m to 0.05 m, and 0.05 m to 0.1 m. Concentrations

of barium greater than generic CCME CEQG Parkland land use were detected in each interval. The variability of barium concentrations in those samples is listed in the following table.

Summary of 2004 Background Area Soil Concentrations of Barium

Parameter	n	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg +/-SD)	90th Percentile (mg/kg)	75th Percentile (mg/kg)
Barium	12	228	2140	1185	1249 +/-518	1986	1560

n = number of samples.

SD = standard deviation.

The concentrations of Barium remaining within the footprint of the North Shore area after remediation are within the range of the background concentrations. In addition, the immobile nature of the Barium encountered on site was demonstrated in the ESA leachate test results that returned Barium concentrations at levels less than the detection limit and it was therefore not identified as a contaminant of concern in the ESA.

The confirmatory samples supported by the QA/QC samples from the North Shore area provide confidence that the remediation of the North Shore complies with the SQRO's.

CONCLUSION

Based on confirmatory sampling consistent with good practice and the approved site specific sampling procedures and protocols, the remediation of the North Shore area has been completed to meet the Polaris Mine remedial targets, as documented in the approved Polaris Mine Decommissioning and Remediation Plan, March 2001.

LIMITATIONS

This report has been prepared by Gartner Lee Limited and the information in this report is intended for the use of Teck Cominco Metals Ltd. during the decommissioning and reclamation program at the Polaris Mine Site. Any use which a third party makes of this report, or any reliance on or decisions made on the basis of the information in this report is the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by the third party, based on the use of or reliance on any information contained in this report.

The scope of Gartner Lee Limited's work was limited to that described in this report. The confirmation of environmental conditions at the site of the remedial work is based on sampling at

specific wall and floor locations within the excavation limits. Gartner Lee Limited has used judgement in the interpretation of the available information but subsurface physical and/or chemical characteristics may vary between or beyond sampling locations. Gartner Lee Limited is not a guarantor of the environmental condition of the site but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent environmental professionals practicing in the Nunavut Territory.

Yours very truly,
GARTNER LEE LIMITED

Dennis Lu, B.Sc.
Field Scientist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

Dr. Dennis Gregor, P.Geol.
Senior Reviewer, Senior Aquatic Scientist

AL:DL:gc

ATTACHMENTS

Tables

Table NS-25-1:	North Shore Remediation Confirmation Soil Samples – Hydrocarbons
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Table NS-26-1. North Shore Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore							
		Sample ID	Shore-10042-F-D	Shore-10051-F-C	Shore-10062-F-C	Shore-10073-F-D	Shore-10076-F-D	Shore-10079-F-D	Shore-10080-F-C	Shore-10081-F-C
		Date Sampled	13-Apr-04	13-Apr-04	13-Apr-04	15-Apr-04	15-Apr-04	15-Apr-04	15-Apr-04	15-Apr-04
		ALS File Number	U4484	U2687	U2687	U4484	U2688R	U2688R	U2688R	U2688R
		Field Screen (ppm)[b]	35	-	-	50	60	45	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	<200	220	<200	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	<200	<200
LEPH[c]	1000	mg/kg	-	-	-	-	-	<200	<200	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	<200	<200	-

Bold *Concentration exceeds the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table NS-26-1. North Shore Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore							
		Sample ID	Shore-10082-F-C	Shore-10131-F-C	Shore-10132-F-C	Shore-10133-F-C	Shore-10136-F-Q	Shore-10286-F-C	Shore-10491-F-C	Shore-10794-F-D
		Date Sampled	15-Apr-04	20-Apr-04	20-Apr-04	20-Apr-04	20-Apr-04	28-Apr-04	06-May-04	24-May-04
		ALS File Number	U2688R	U2778r	U2778R	U2778R	U5597r	U3083	U3342	U3969R
		Field Screen (ppm)[b]	-	-	-	-	-	-	-	65
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	<200	870	810	<200	<200	<200	<200	370
EPH C_{19}-C_{32}	1000	mg/kg	<200	<200	<200	<200	<200	<200	460	460
LEPH[c]	1000	mg/kg	-	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	-	-	-	-	-	-	-	-

Bold *Concentration exceeds the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table NS-26-1. North Shore Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore							
		Sample ID	Shore-10800-F-D	Shore-10845-F-C	Shore-10846-F-C	Shore-10850-F-Q	Shore-10847-F-C	Shore-10848-F-Q	Shore-11171-F-C	Shore-11755-F-C
		Date Sampled	24-May-04	24-May-04	24-May-04	24-May-04	24-May-04	24-May-04	04-Jun-04	06-Jul-04
		ALS File Number	U3969R	U3969R	U3969R	duplicate of Shore-10846-F-C	U3969R	duplicate of Shore-10847-F-C	U4269R	U5597R
		Field Screen (ppm)[b]	70	-	-		-		-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	**1180**	940	640	840	580	510	900	<200
EPH C_{19}-C_{32}	1000	mg/kg	**1010**	370	490	510	430	410	990	<200
LEPH[c]	1000	mg/kg	**1180**	-	640	-	-	-	-	-
HEPH[c]	1000	mg/kg	**1010**	-	490	-	-	-	-	-

Bold *Concentration exceeds the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table NS-26-1. North Shore Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore							
		Sample ID	Shore-11757-F-C	Shore-11823-F-C	Shore-11824-F-C	Shore-11748-F-Q	Shore-11825-F-C	Shore-11909-F-C	Shore-11938-F-C	Shore-12144-F-D
		Date Sampled	08-Jul-04	30-Jun-04	30-Jun-04	30-Jun-04	30-Jun-04	06-Jul-04	07-Jul-04	12-Aug-04
		ALS File Number	U5615R	U5353R	U5353R	duplicate of Shore-11824-F-C	U5353R	U5597R	U5615R	U7283
		Field Screen (ppm)[b]	-	5	5		5	-	-	-
Parameter	**Site Specific**	**Units**	**Analytical Results**							
Extractable Hydrocarbons										
EPH C_{10}-C_{19}	1000	mg/kg	220	<200	220	<200	270	<200	210	230
EPH C_{19}-C_{32}	1000	mg/kg	<200	340	400	350	450	290	370	410
LEPH[c]	1000	mg/kg	220	-	-	-	-	-	-	-
HEPH[c]	1000	mg/kg	<200	-	-	-	-	-	-	-

Bold *Concentration exceeds the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table NS-26-1. North Shore Remediation Confirmation Soil Samples - Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore					
		Sample ID	Shore-12156-F-C	Shore-12159-F-Q	Shore-12157-F-C	Shore-12161-F-Q	Shore-12158-F-C	Shore-12160-F-Q
		Date Sampled	12-Aug-04	12-Aug-04	12-Aug-04	12-Aug-04	12-Aug-04	12-Aug-04
		ALS File Number	U7283	duplicate of Shore-12156-F-C	U7283	duplicate of Shore-12157-F-C	U7283	duplicate of Shore-12158-F-C
		Field Screen (ppm)[b]	-		-		-	
Parameter	**Site Specific**	**Units**	**Analytical Results**					
Extractable Hydrocarbons								
EPH C_{10}-C_{19}	1000	mg/kg	<200	<200	<200	290	<200	<200
EPH C_{19}-C_{32}	1000	mg/kg	<200	240	<200	520	240	<200
LEPH[c]	1000	mg/kg	<200	-	<200	-	<200	-
HEPH[c]	1000	mg/kg	<200	-	<200	-	240	-

Bold *Concentration exceeds the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The approved Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on the Yukon Territorial Contaminated Sites Regulation for Parkland (PL) Land Use.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are determined by subtracting Polycyclic Aromatic Hydrocarbons (PAH) from Extractable Petroleum Hydrocarbons (EPH), therefore use of the EPH remediation objective is conservative.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore						
				ALS Sample ID	Shore-510-F-C	Shore-10000-F-D	Shore-10001-F-D	Shore-10042-F-D	Shore-10051-F-C	Shore-10062-F-C	Shore-10073-F-D
				Date Sampled	28-Oct-03	28-Oct-03	28-Oct-03	13-Apr-04	13-Apr-04	13-Apr-04	15-Apr-04
				ALS File Number	T6195	U3083	U3083	U2687	U2687	U2687	U2688R
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	294	370	27	-	-	27
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	1867	1869	296	-	-	207
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH											
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	1090	720	1250	<150	<150	<150	<150
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	8850	2850	1730	31.1	18.6	150	9.2

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore						
				ALS Sample ID	Shore-10076-F-D	Shore-10079-F-D	Shore-10080-F-C	Shore-10081-F-C	Shore-10082-F-C	Shore-10116-F-D	Shore-10131-F-C
				Date Sampled	15-Apr-04	15-Apr-04	15-Apr-04	15-Apr-04	15-Apr-04	15-Apr-04	20-Apr-04
				ALS File Number	U2688R	U2688R	U2688R	U2688R	U2688R	U2778R	U2778r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	24	28	-	-	-	137	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	150	163	-	-	-	1302	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH											
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<150	<150	<150	<150	<150	<150	<150
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	7.4	7.1	8.2	125	15.5	623	168

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore						
				ALS Sample ID	Shore-10132-F-C	Shore-10133-F-C	Shore-10136-F-Q	Shore-10134-F-C	Shore-10135-F-C	Shore-10286-F-C	Shore-10314-F-D
				Date Sampled	20-Apr-04	20-Apr-04	18-Apr-04	18-Apr-04	18-Apr-04	28-Apr-04	04-May-04
				ALS File Number	U2778r	U2778r	U2778r	U2778r	U2778r	U3083	U4484
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	-	duplicate of	-	-	-	366
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	-	Shore-10133-F-C	-	-	-	2344
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH					8.76						
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	<30	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	<15	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	318	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	<2	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	<2	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	<6	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	<6	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	<3	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	<150	<150	<150	<150	**2320**	<150	1390
Mercury	T-Hg	-	7	mg/kg	<0.050	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	<12	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	<15	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	<6	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	<6	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	<15	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	14	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	177	677	479	10.5	7210	23	5830

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore						
				ALS Sample ID	Shore-10360-F-C	Shore-10582-F-C	Shore-10583-F-C	Shore-10584-F-C	Shore-10585-F-C	Shore-10586-F-C	Shore-10587-F-C
				Date Sampled	04-May-04	10-May-04	10-May-04	10-May-04	10-May-04	10-May-04	10-May-04
				ALS File Number	U3240	U3476r	U3476r	U3476r	U3476r	U3476r	U3476r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	-	-	-	-	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	-	-	-	-	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH											
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	150	<100	980	<100	340	440	<100
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	1230	81.7	5310	75.4	850	1500	563

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore						
				ALS Sample ID	Shore-10588-F-C	Shore-10794-F-D	Shore-10800-F-D	Shore-10845-F-C	Shore-10846-F-C	Shore-10850-F-Q	Shore-10847-F-C
				Date Sampled	10-May-04	24-May-04	24-May-04	24-May-04	24-May-04	24-Mau-04	24-May-04
				ALS File Number	U3476r	U3969R	U3969R	U3969r	U3969r	U3969r	U3969r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	-	29	161	-	-	duplicate of	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	-	182	649	-	-	Shore-1046-F-C	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH							8.80		8.95		
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	<20	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	-	-	<10	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	-	-	418	-	479	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	<1.0	-	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	2.3	-	<1	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	<4.0	-	<4	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	<4.0	-	<4	-	-
Copper	T-Cu	-	63	mg/kg	-	-	<2.0	-	<2	-	-
Lead	T-Pb	2000	-	mg/kg	**2140**	<100	230	140	<100	<100	<100
Mercury	T-Hg	-	7	mg/kg	-	-	<0.050	-	<0.050	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	<8.0	-	<8	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	<10	-	<10	-	-
Selenium	T-Se	-	1	mg/kg	-	-	<4.0	-	<4	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	<4.0	-	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	<10	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	-	-	<10.6	-	12	-	-
Zinc	T-Zn	10000	-	mg/kg	**10700**	71.5	1190	387	153	460	159

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore						
				ALS Sample ID	Shore-10848-F-Q	Shore-11022-S-D	Shore-11171-F-C	Shore-11477-F-C	Shore-11757-F-C	Shore-11823-F-C	Shore-11824-F-C
				Date Sampled	24-May-04	09-May-04	04-Jun-04	15-Jun-04	08-Jul-04	30-Jun-04	30-Jun-04
				ALS File Number	U3969r	U4269r	U4269r	U4781	U5615R	U5353r	U5353r
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	duplicate of	-	-	78	-	-	297
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	Shore-10847-F-C	-	-	344	-	-	1388
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH									8.94		
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-		-	-	<20	-	-
Arsenic	T-As	-	12	mg/kg	-		-	-	<10	-	-
Barium	T-Ba	-	500	mg/kg	-		-	-	286	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-		-	-	<1	-	-
Cadmium	T-Cd	-	10	mg/kg	-		-	-	10	-	-
Chromium	T-Cr	-	64	mg/kg	-		-	-	5	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-		-	-	<4	-	-
Copper	T-Cu	-	63	mg/kg	-		-	-	6	-	-
Lead	T-Pb	2000	-	mg/kg	<100	1160	1230	121	320	170	<50
Mercury	T-Hg	-	7	mg/kg	-		-	-	<0.050	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-		-	-	<8	-	-
Nickel	T-Ni	-	50	mg/kg	-		-	-	<10	-	-
Selenium	T-Se	-	1	mg/kg	-		-	-	<4	-	-
Silver	T-Ag	-	20[d]	mg/kg	-		-	-	<4	-	-
Tin	T-Sn	-	50[d]	mg/kg	-		-	-	<10	-	-
Vanadium	T-V	-	130	mg/kg	-		-	-	30	-	-
Zinc	T-Zn	10000	-	mg/kg	186	3870	4460	214	3010	425	456

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee		Polaris Mine Soil Quality Remediation Objectives[a]		Location	North Shore						
				ALS Sample ID	Shore-11748-F-Q	Shore-11825-F-C	Shore-11852-W-C	Shore-11853-W-C	Shore-11909-F-C	Shore-11938-F-C	Shore-12140-F-D
				Date Sampled	30-Jun-04	30-Jun-04	02-Jul-04	02-Jul-04	06-Jul-04	07-Jul-04	12-Aug-04
				ALS File Number	U5353r	U5353r	U5597r	U5597r	U5597r	U5615r	U7283
				Field Screen Pb (ppm)[b]	duplicate of	361	-	-	-	-	270
				Field Screen Zn (ppm)[b]	Shore-11824-F-C	773	-	-	-	-	456
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**						
pH											
Total Metals											
Antimony	T-Sb	-	20[d]	mg/kg	-	-	-	-	-	-	-
Arsenic	T-As	-	12	mg/kg	-	-	-	-	-	-	-
Barium	T-Ba	-	500	mg/kg	-	-	-	-	-	-	-
Beryllium	T-Be	-	4[d]	mg/kg	-	-	-	-	-	-	-
Cadmium	T-Cd	-	10	mg/kg	-	-	-	-	-	-	-
Chromium	T-Cr	-	64	mg/kg	-	-	-	-	-	-	-
Cobalt	T-Co	-	50[d]	mg/kg	-	-	-	-	-	-	-
Copper	T-Cu	-	63	mg/kg	-	-	-	-	-	-	-
Lead	T-Pb	2000	-	mg/kg	243	<50	<100	<100	<100	140	410
Mercury	T-Hg	-	7	mg/kg	-	-	-	-	-	-	-
Molybdenum	T-Mo	-	10[d]	mg/kg	-	-	-	-	-	-	-
Nickel	T-Ni	-	50	mg/kg	-	-	-	-	-	-	-
Selenium	T-Se	-	1	mg/kg	-	-	-	-	-	-	-
Silver	T-Ag	-	20[d]	mg/kg	-	-	-	-	-	-	-
Tin	T-Sn	-	50[d]	mg/kg	-	-	-	-	-	-	-
Vanadium	T-V	-	130	mg/kg	-	-	-	-	-	-	-
Zinc	T-Zn	10000	-	mg/kg	557	106	241	228	82.3	447	1330

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.

b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-2. North Shore Remediation Confirmation Soil Samples - Metals

Gartner Lee				Location	North Shore				
				ALS Sample ID	Shore-12144-F-D	Shore-12156-F-C	Shore-12159-F-Q	Shore-12157-F-C	Shore-12158-F-C
				Date Sampled	12-Aug-04	12-Aug-04	12-Aug-04	12-Aug-04	12-Aug-04
				ALS File Number	U7283	U7283	U7283	U7283	U7283
		Polaris Mine Soil Quality		Field Screen Pb (ppm)[b]	235	-	duplicate of	-	-
		Remediation Objectives[a]		Field Screen Zn (ppm)[b]	726	-	Shore-12156-F-C	-	-
Parameter		**Site Specific**	**CEQG (PL)[c]**	**Units**	**Analytical Results**				
pH						8.5	9	8.82	8.68
Total Metals									
Antimony	T-Sb	-	20[d]	mg/kg	-	<20	<20	<20	<20
Arsenic	T-As	-	12	mg/kg	-	<10	<10	<10	<10
Barium	T-Ba	-	500	mg/kg	-	**719**	643	**499**	**727**
Beryllium	T-Be	-	4[d]	mg/kg	-	<1	<1	<1	<1
Cadmium	T-Cd	-	10	mg/kg	-	2	<1	<1	1
Chromium	T-Cr	-	64	mg/kg	-	10	9	9	10
Cobalt	T-Co	-	50[d]	mg/kg	-	<4	<4	<4	<4
Copper	T-Cu	-	63	mg/kg	-	14	12	14	13
Lead	T-Pb	2000	-	mg/kg	470	270	<100	<100	170
Mercury	T-Hg	-	7	mg/kg	-	0.065	0.059	0.062	0.065
Molybdenum	T-Mo	-	10[d]	mg/kg	-	<8	<8	<8	<8
Nickel	T-Ni	-	50	mg/kg	-	20	15	16	18
Selenium	T-Se	-	1	mg/kg	-	<9	<9	<7	<10
Silver	T-Ag	-	20[d]	mg/kg	-	<4	<4	<4	<4
Tin	T-Sn	-	50[d]	mg/kg	-	<10	<10	<10	<10
Vanadium	T-V	-	130	mg/kg	-	50	51	51	57
Zinc	T-Zn	10000	-	mg/kg	1840	494	83.5	64.3	223

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:
"<" = Less than analytical method detection limit.
"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and expsoure pathways.
b) Field screening results are measured using a Niton Xli 700 Series portable X-Ray Fluorescence (XRF) elemental analyser.
c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.
d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-3. North Shore Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore				
		ALS Sample ID	Shore-10079-F-D	Shore-10080-F-C	Shore-10800-F-D	Shore-10846-F-C	Shore-11757-F-C
		Date Sampled	15/04/2004	4/15/2004	24-May-04	5/24/2004	7/8/2004
		ALS File Number	U2688R	U2688R	U3969r	U3969r	U5615r
		Field Screen (ppm)[b]	45	-	70	-	-
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**				
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	-	mg/kg	<0.04	<0.04	<0.06	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05	<0.06	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	0.106	0.332	<0.08	<0.08	0.188
Phenanthrene	5[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-3. North Shore Remediation Confirmation Soil Samples - Polycyclic Aromatic Hydrocarbons

Gartner Lee	Polaris Mine Soil Quality Remediation Objectives[a]	Location	North Shore		
		ALS Sample ID	Shore-12156-F-C	Shore-12157-F-C	Shore-12158-F-C
		Date Sampled	12-Aug-04	12-Aug-04	12-Aug-04
		ALS File Number	U7283	U7283	U7283
		Field Screen (ppm)[b]	-	-	-
Parameter	**CEQG (PL)[c]**	**Units**	**Analytical Results**		
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	-	mg/kg	<0.04	<0.04	<0.04
Acenaphthylene	-	mg/kg	<0.05	<0.05	<0.05
Anthracene	-	mg/kg	<0.05	<0.05	<0.05
Benz(a)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	mg/kg	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05
Benzo(g,h,I)perylene	-	mg/kg	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1[d]	mg/kg	<0.05	<0.05	<0.05
Chrysene	-	mg/kg	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	1[d]	mg/kg	<0.05	<0.05	<0.05
Fluoranthene	-	mg/kg	<0.05	<0.05	<0.05
Fluorene	-	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3,-c,d)pyrene	1[d]	mg/kg	<0.05	<0.05	<0.05
Napthalene	0.6	mg/kg	<0.05	<0.05	<0.05
Phenanthrene	5[d]	mg/kg	<0.05	<0.05	<0.05
Pyrene	10[d]	mg/kg	<0.05	<0.05	<0.05

Bold *Concentration greater than or equal to the Soil Quality Remediation Objective (SQRO) for the Polaris Mine Site.*

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

a) The Soil Quality Remediation Objectives (SQROs) for the Polaris Mine Site are based on Canadian Council of Ministers of the Environment (CCME) standards and guidelines. The CCME provides criteria based on land use activities and applies the most strigent criteria based on site-specific receptors and exposure pathways.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

c) Canadian Environmental Quality Guidelines (CEQG) for Parkland (PL) Land Use. The site-specific factors used for determining the soil quality guidelines were: soil ingestion, soil contact and nutrient cycling.

d) Interim Remediation Criterion. Soil Quality Guidelines based on the CCME soil protocol have not yet been developed for a given parameter.

Table NS-26-4. North Shore Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee			Location	North Shore					
			Sample ID	Shore-10133-F-C	Shore-10846-F-C	Shore-10847-F-C	Shore-11824-F-C	Shore-12156-F-C	Shore-12157-F-C
			Duplicate ID	Shore-10136-F-Q	Shore-10850-F-Q	Shore-10848-F-Q	Shore-11748-F-Q	Shore-12159-F-Q	Shore-12161-F-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**					
Analytical Laboratory Duplicates									
Extractable Hydrocarbons									
EPH C_{10}-C_{19}									
Sample Result	mg/kg	200	1000	<200	640	580	220	<200	<200
Duplicate Result	mg/kg	200	1000	<200	840	510	<200	<200	290
RpD	**%**			na	na	na	na	na	na
EPH C_{19}-C_{32}									
Sample Result	mg/kg	200	1000	<200	490	430	400	<200	<200
Duplicate Result	mg/kg	200	1000	<200	510	410	350	240	520
RpD	**%**			na	na	na	na	na	na
Analytical Laboratory Replicates									
Extractable Hydrocarbons									
EPH C_{10}-C_{19}									
Sample Result	mg/kg	200	1000						
Duplicate Result	mg/kg	200	1000						
RpD	**%**								
EPH C_{19}-C_{32}									
Sample Result	mg/kg	200	1000						
Duplicate Result	mg/kg	200	1000						
RpD	**%**								

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table NS-26-4. North Shore Quality Assurance and Quality Control Remediation Soil Samples - Hydrocarbons

Gartner Lee			Location	North Shore				
			Sample ID	Shore-12158-F-C	Shore-10081-F-C	Shore-10131-F-C	Shore-11938-F-C	Shore-12158-F-C
			Duplicate ID	Shore-12160-F-Q	QC# 383542	QC# 383928	QC# 395282	QC# 402626
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**				
Analytical Laboratory Duplicates								
Extractable Hydrocarbons								
EPH C_{10}-C_{19}								
Sample Result	mg/kg	200	1000	<200				
Duplicate Result	mg/kg	200	1000	<200				
RpD	**%**			na				
EPH C_{19}-C_{32}								
Sample Result	mg/kg	200	1000	240				
Duplicate Result	mg/kg	200	1000	<200				
RpD	**%**			na				
Analytical Laboratory Replicates								
Extractable Hydrocarbons								
EPH C_{10}-C_{19}								
Sample Result	mg/kg	200	1000		<200	870	210	<200
Duplicate Result	mg/kg	200	1000		<200	700	<200	<200
RpD	**%**				na	na	na	na
EPH C_{19}-C_{32}								
Sample Result	mg/kg	200	1000		<200	<200	370	240
Duplicate Result	mg/kg	200	1000		<200	<200	340	200
RpD	**%**				na	na	na	na

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL.*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table NS-26-5. North Shore Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee	Location			North Shore								
	Sample ID			Shore-10081-F-C	Shore-10101-F-D	Shore-10102-F-D	Shore-10103-F-D	Shore-10104-F-D	Shore-10105-F-D	Shore-10106-F-D	Shore-10131-F-C	Shore-10133-F-C
	Duplicate ID			QC# 383542	Shore-10149-F-Q	Shore-10150-F-Q	Shore-10151-F-Q	Shore-10152-F-Q	Shore-10153-F-Q	Shore-10154-F-Q	QC# 383928	Shore-10136-F-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**								
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350	-	30	10	17	22	31	25	-	-
Duplicate Result	mg/kg	70	350	-	139	317	32	609	695	719	-	-
RpD	**%**				na	na	na	na	na	na		
Zinc (Zn)												
Sample Result	mg/kg	150	750	-	136	213	118	103	178	150	-	-
Duplicate Result	mg/kg	150	750	-	537	1455	398	1577	2329	4199	-	-
RpD	**%**				na	na	na	na	na	na		
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	-	-	-	-	-	-	-	-	<150
Duplicate Result	mg/kg	100	500	-	-	-	-	-	-	-	-	<150
RpD	**%**											na
Zinc (Zn)					-							
Sample Result	mg/kg	3	15	-	-	-	-	-	-	-	-	677
Duplicate Result	mg/kg	3	15	-	-	-	-	-	-	-	-	479
RpD	**%**											34%
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	<150	-	-	-	-	-	-	<150	-
Duplicate Result	mg/kg	100	500	<150	-	-	-	-	-	-	<150	-
RpD	**%**			na							na	
Zinc (Zn)												
Sample Result	mg/kg	3	15	125	-	-	-	-	-	-	168	-
Duplicate Result	mg/kg	3	15	97	-	-	-	-	-	-	129	-
RpD	**%**			25%							26%	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL..*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table NS-26-5. North Shore Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee	Location			North Shore								
	Sample ID			Shore-10147-W-D	Shore-10585-F-C	Shore-10779-F-D	Shore-10846-F-C	Shore-10847-F-C	Shore-11220-F-C	Shore-11317-F-D	Shore-11477-F-C	Shore-11821-F-C
	Duplicate ID			Shore-10148-W-Q	QC# 386677	QC# 390728	Shore-10850-F-Q	Shore-10848-F-Q	QC# 389862	QC# 394459	QC# 391813	QC# 394458
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**								
On Site Field Screening Duplicates												
Lead (Pb)												
Sample Result	mg/kg	70	350	267	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	70	350	272	-	-	-	-	-	-	-	-
RpD	**%**			na								
Zinc (Zn)												
Sample Result	mg/kg	150	750	1508	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	150	750	1519	-	-	-	-	-	-	-	-
RpD	**%**			1%								
Analytical Laboratory Duplicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	-	-	680	<100	<100	340	<100	-	228
Duplicate Result	mg/kg	100	500	-	-	790	<100	<100	340	<100	-	314
RpD	**%**					15%	n/a	n/a	0%	na		32%
Zinc (Zn)												
Sample Result	mg/kg	3	15	-	-	1190	153	159	1010	241	-	616
Duplicate Result	mg/kg	3	15	-	-	1110	460	186	925	547	-	653
RpD	**%**					7%	**100%**	16%	9%	78%		6%
Analytical Laboratory Replicates												
Lead (Pb)												
Sample Result	mg/kg	100	500	-	340	-	-	580	-	-	121	-
Duplicate Result	mg/kg	100	500	-	310	-	-	510	-	-	91	-
RpD	**%**				na			13%			na	
Zinc (Zn)												
Sample Result	mg/kg	3	15	-	850	-	-	430	-	-	214	-
Duplicate Result	mg/kg	3	15	-	827	-	-	410	-	-	209	-
RpD	**%**				3%			5%			2%	

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL..*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table NS-26-5. North Shore Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee				Location	North Shore									
				Sample ID	Shore-11824-F-C	Shore-11938	Shore-12140-F-D	Shore-12141-F-D	Shore-12142-F-D	Shore-12143-F-D	Shore-12144-F-D	Shore-12145-F-D	Shore-12146-F-D
				Duplicate ID	Shore-11748-F-Q	QC# 395282	Shore-12361-F-Q	Shore-12362-F-Q	Shore-12363-F-Q	Shore-12364-F-Q	Shore-12365-F-Q	Shore-12366-F-Q	Shore-12367-F-Q
Parameter	**Units**	**MDL**	**PQL**		**Analytical Results**								
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350	-	-	270	263	171	292	235	269	78
Duplicate Result	mg/kg	70	350	-	-	296	294	214	258	246	233	92
RpD	**%**					na	na	na	na	na	na	na
Zinc (Zn)													
Sample Result	mg/kg	150	750	-	-	456	549	353	750	726	894	165
Duplicate Result	mg/kg	150	750	-	-	897	530	549	908	522	428	83
RpD	**%**					na	na	na	19%	na	na	na
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500	<50	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500	243	-	-	-	-	-	-	-	-
RpD	**%**			n/a								
Zinc (Zn)													
Sample Result	mg/kg	3	15	456	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15	557	-	-	-	-	-	-	-	-
RpD	**%**			20%								
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500	-	140	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500	-	130	-	-	-	-	-	-	-
RpD	**%**				na							
Zinc (Zn)													
Sample Result	mg/kg	3	15	-	447	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15	-	399	-	-	-	-	-	-	-
RpD	**%**				11%								

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL..*

Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.

Table NS-26-5. North Shore Quality Assurance and Quality Control Remediation Soil Samples - Metals

Gartner Lee	Location			North Shore									
	Sample ID			Shore-12147-F-D	Shore-12148-F-D	Shore-12149-F-D	Shore-12150-F-D	Shore-12151-F-D	Shore-12152-F-D	Shore-12153-F-D	Shore-12154-F-D	Shore-12155-F-D	Shore-12156-F-C
	Duplicate ID			Shore-12368-F-Q	Shore-12369-F-Q	Shore-12370-F-Q	Shore-12371-F-Q	Shore-12372-F-Q	Shore-12373-F-Q	Shore-12374-F-Q	Shore-12375-F-Q	Shore-12376-F-Q	Shore-12159-F-Q
Parameter	**Units**	**MDL**	**PQL**	**Analytical Results**									
On Site Field Screening Duplicates													
Lead (Pb)													
Sample Result	mg/kg	70	350	95	110	92	100	128	108	90	88	98	-
Duplicate Result	mg/kg	70	350	109	106	104	119	88	116	130	91	108	-
RpD	**%**			na	na	na	na	na	na	na	na	na	
Zinc (Zn)													
Sample Result	mg/kg	150	750	120	155	138	167	149	55	107	97	185	-
Duplicate Result	mg/kg	150	750	156	117	182	130	136	162	116	47	169	-
RpD	**%**			na	na	na	na	na	na	na	na	na	
Analytical Laboratory Duplicates													
Lead (Pb)													
Sample Result	mg/kg	100	500	-	-	-	-	-	-	-	-	-	270
Duplicate Result	mg/kg	100	500	-	-	-	-	-	-	-	-	-	<100
RpD	**%**												na
Zinc (Zn)													
Sample Result	mg/kg	3	15	-	-	-	-	-	-	-	-	-	494
Duplicate Result	mg/kg	3	15	-	-	-	-	-	-	-	-	-	84
RpD	**%**												**142%**
Analytical Laboratory Replicates													
Lead (Pb)													
Sample Result	mg/kg	100	500	-	-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	100	500	-	-	-	-	-	-	-	-	-	-
RpD	**%**												
Zinc (Zn)													
Sample Result	mg/kg	3	15	-	-	-	-	-	-	-	-	-	-
Duplicate Result	mg/kg	3	15	-	-	-	-	-	-	-	-	-	-
RpD	**%**												

Bold *RpD Value is greater than or equal to 50% and the concentrations of both samples are greater than the PQL..*

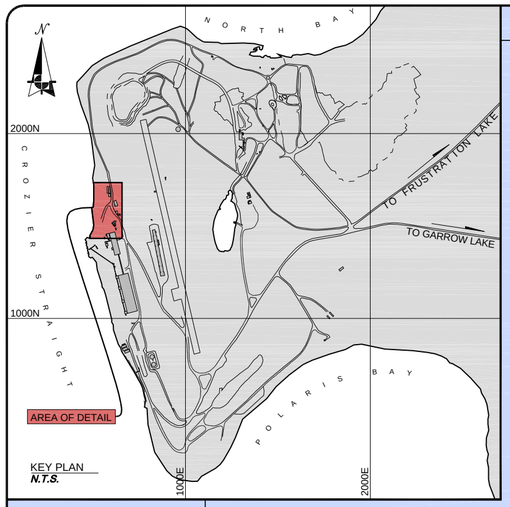
Notes:

na RpD value is not applicable because one or both results are less than the PQL.

*RpD Relative Percent Difference = (Difference/Average)*100.*

*PQL Practical Quantitation Limit = 5 * Method Detection Limit (MDL).*

MDL Method Detection Limit of analysis.



KEY PLAN
N.T.S.

N

0 5 10 20 30 Metres

SCALE 1:750

100-MAN TRAILER CAMP

FIREHALL

MAIN PORTAL

BARGE

TO FIREHALL

FH1 FH2 FH3 FH4 FH5 FH6 FH7 FH8 FH9 FH10 FH11

TP-84 N TP-84 S

TP-203 TP-204 TP-202 TP-83 TP-7 TP-8 TP-9 TP-10 TP-11 TP-14 TP-15 TP-16 TP-17 TP-22 TP-6

BH-1 BH-2 BH-3 BH-4 BH-5

SS FH-A SS FH-B SS FH-C SS 3 SS 4 SS 10

LEGEND:

- LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS BEFORE REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS BEFORE REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- FH5 — TEST PIT (1999/2000 ESA)
- SS20–6 — SURFACE SAMPLE (1999/2000 ESA)

ZINC CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1000 PPM
- 1000–5000 PPM
- 5000–10,000 PPM
- >10,000 PPM

LEAD CONCENTRATION IN SOILS (1999 & 2000 DATA)

- 0–1,000 PPM
- 1,000–2,000 PPM
- > 2,000 PPM

EPH CONCENTRATION IN SOILS (1999 & 2000 DATA)

- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL LESS THAN 1,000 mg/kg
- EPH 10–19 OR EPH 19–32 CONCENTRATION IN SOIL GREATER THAN OR EQUAL TO 1,000 mg/kg

*EPH – EXTRACTABLE PETROLEUM HYDROCARBONS

SOURCE OF DRAWING:

DRAWING INFORMATION:

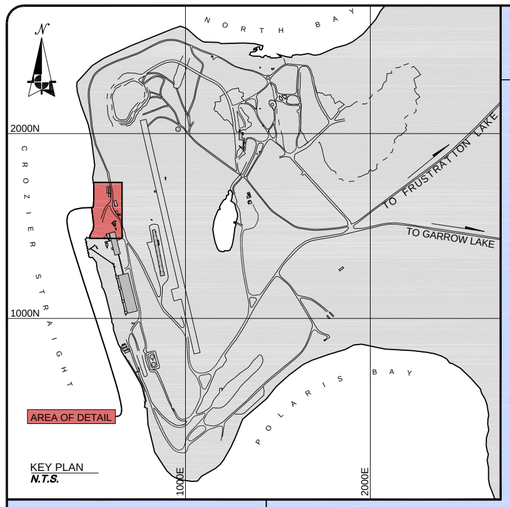
REVIEWED BY:	AL
DRAWN BY:	CHARONE
DATE ISSUED:	ISSUED – JUNE 10, 2005
PROJECT NUMBER:	40–137
FILE NAME:	40137–NS–M1–01.DWG
REVISION:	0

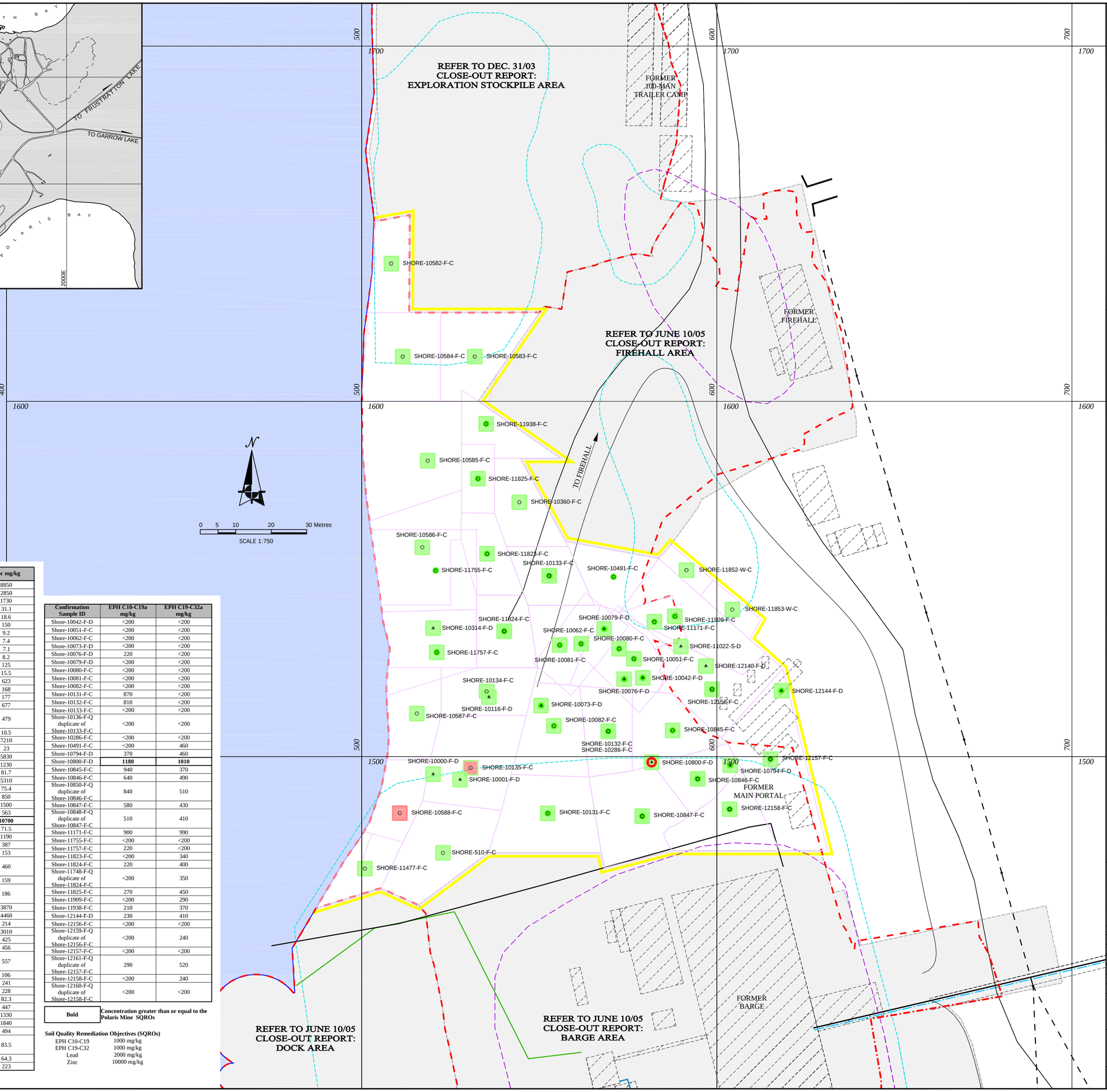
POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

NORTH SHORE CONDITIONS BEFORE REMEDIATION

Gartner Lee

FIGURE NO. **NS-26-1**





Confirmation Sample ID	Lead mg/kg	Zinc mg/kg
Shore-510-F-C	1090	8850
Shore-10000-F-D	720	2850
Shore-10001-F-D	1250	1730
Shore-10042-F-D	<150	31.1
Shore-10051-F-C	<150	18.6
Shore-10062-F-C	<150	150
Shore-10073-F-D	<150	9.2
Shore-10076-F-D	<150	7.4
Shore-10079-F-D	<150	7.1
Shore-10080-F-C	<150	8.2
Shore-10081-F-C	<150	125
Shore-10082-F-C	<150	15.5
Shore-10116-F-D	160	623
Shore-10131-F-C	<150	168
Shore-10132-F-C	<150	177
Shore-10133-F-C	<150	677
Shore-10136-F-Q duplicate of Shore-10133-F-C	<150	479
Shore-10134-F-C	<150	10.5
Shore-10135-F-C	**2320**	7210
Shore-10286-F-C	<150	23
Shore-10314-F-D	1390	5830
Shore-10360-F-C	150	1230
Shore-10582-F-C	<100	81.7
Shore-10583-F-C	980	5310
Shore-10584-F-C	<100	75.4
Shore-10585-F-C	340	850
Shore-10586-F-C	440	1500
Shore-10587-F-C	<100	563
Shore-10588-F-C	**2140**	**10700**
Shore-10794-F-D	<100	71.5
Shore-10800-F-D	230	1190
Shore-10845-F-C	140	387
Shore-10846-F-C	<100	153
Shore-10850-F-Q duplicate of Shore-10846-F-C	<100	460
Shore-10847-F-C	<100	159
Shore-10848-F-Q duplicate of Shore-10847-F-C	<100	186
Shore-11022-S-D	1160	3870
Shore-11171-F-C	1230	4460
Shore-11477-F-C	121	214
Shore-11757-F-C	320	3010
Shore-11823-F-C	170	425
Shore-11824-F-C	<50	456
Shore-11748-F-Q duplicate of Shore-11824-F-C	243	557
Shore-11825-F-C	<50	106
Shore-11852-W-C	<100	241
Shore-11853-W-C	<100	228
Shore-11909-F-C	<100	82.3
Shore-11938-F-C	140	447
Shore-12140-F-D	410	1330
Shore-12144-F-D	470	1840
Shore-12156-F-C	270	494
Shore-12159-F-Q duplicate of Shore-12156-F-C	<100	83.5
Shore-12157-F-C	<100	64.3
Shore-12158-F-C	170	223

Confirmation Sample ID	EPH C10-C19a mg/kg	EPH C19-C32a mg/kg
Shore-10042-F-D	<200	<200
Shore-10051-F-C	<200	<200
Shore-10062-F-C	<200	<200
Shore-10073-F-D	<200	<200
Shore-10076-F-D	220	<200
Shore-10079-F-D	<200	<200
Shore-10080-F-C	<200	<200
Shore-10081-F-C	<200	<200
Shore-10082-F-C	<200	<200
Shore-10131-F-C	870	<200
Shore-10132-F-C	810	<200
Shore-10133-F-C	<200	<200
Shore-10136-F-Q duplicate of Shore-10133-F-C	<200	<200
Shore-10286-F-C	<200	<200
Shore-10491-F-C	<200	460
Shore-10794-F-D	370	460
Shore-10800-F-D	**1180**	**1010**
Shore-10845-F-C	940	370
Shore-10846-F-C	640	490
Shore-10850-F-Q duplicate of Shore-10846-F-C	840	510
Shore-10847-F-C	580	430
Shore-10848-F-Q duplicate of Shore-10847-F-C	510	410
Shore-11171-F-C	900	990
Shore-11755-F-C	<200	<200
Shore-11757-F-C	220	<200
Shore-11823-F-C	<200	340
Shore-11824-F-C	220	400
Shore-11748-F-Q duplicate of Shore-11824-F-C	<200	350
Shore-11825-F-C	270	450
Shore-11909-F-C	<200	290
Shore-11938-F-C	210	370
Shore-12144-F-D	230	410
Shore-12156-F-C	<200	<200
Shore-12159-F-Q duplicate of Shore-12156-F-C	<200	240
Shore-12157-F-C	<200	<200
Shore-12161-F-Q duplicate of Shore-12157-F-C	290	520
Shore-12158-F-C	<200	240
Shore-12160-F-Q duplicate of Shore-12158-F-C	<200	<200

Bold — Concentration greater than or equal to the Polaris Mine SQROs

Soil Quality Remediation Objectives (SQROs)

EPH C10-C19	1000 mg/kg
EPH C19-C32	1000 mg/kg
Lead	2000 mg/kg
Zinc	10000 mg/kg

LEGEND:

- FORMER LOCATION OF BUILDING
- SHORE LINE
- ROADS
- TAILINGS LINE
- TAILINGS LINE (FORMER)
- FUEL LINE
- GROUND WIRE
- SEWER LINE
- GROUND CONTOURS AFTER REMEDIATION (m) – MAJOR (1.0m)
- GROUND CONTOURS AFTER REMEDIATION (m) – MINOR (0.2m)
- AREA BOUNDARY
- LIMIT OF REMEDIAL EXCAVATION
- AREA OF CONCERN FOR HYDROCARBON CONTAMINATION FROM THE 1999–2000 ESA
- AREA OF CONCERN FOR METALS CONTAMINATION FROM THE 1999–2000 ESA
- OVERHEAD POWER LINE
- POWER POLE
- COMPOSITE CONFIRMATORY FLOOR OR WALL SAMPLE
- DISCRETE CONFIRMATION OR WALL SAMPLE

SAMPLE NAMING CONVENTION

ESP–7–I–D
- ESP = AREA
- 7 = SAMPLE ID
- I = LOCATION
- D = TYPE
  - C= COMPOSITE SAMPLE FLOOR–5 SAMPLES IN A 25x25m AREA WALL–5 SAMPLES ALONG 25m OF WALL
  - D= DISCRETE SAMPLE
  - Q= DUPLICATED QUALITY ASSURANCE/ QUALITY CONTROL SAMPLE
  - F= FLOOR SAMPLE
  - I= INTERMEDIATE FLOOR SAMPLE
  - W= WALL SAMPLE

- SOIL SAMPLE FROM EXCAVATION CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- SOIL SAMPLE FROM EXCAVATION CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32
- *EPH – EXTRACTABLE PETROLEUM HYDROCARBONS
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 10,000 mg/kg ZINC
- SAMPLE CONTAINS GREATER THAN OR EQUAL TO 2,000 mg/kg LEAD
- SAMPLE CONTAINS LESS THAN 10,000 mg/kg ZINC
- SAMPLE CONTAINS LESS THAN 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS GREATER THAN 1,000 mg/kg EPH 10–19 OR EPH 19–32 AND/OR GREATER THAN 10,000 mg/kg ZINC OR 2,000 mg/kg LEAD
- AREA OF WALL COMPOSITE SAMPLE CONTAINS LESS THAN 1,000 mg/kg EPH 10–19 AND EPH 19–32 AND/OR LESS THAN 10,000 mg/kg ZINC AND 2,000 mg/kg LEAD

SOURCE OF DRAWING:

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POLARIS MINE
CONTAMINATED SITE REMEDIATION
LITTLE CORNWALLIS ISLAND, NUNAVUT

NORTH SHORE CONDITIONS AFTER REMEDIATION

Gartner Lee

FIGURE NO. NS-26-2

APPENDIX 6

VERIFICATION OF ABSENCE

OF

PCB CONTAINING TRANSFORMERS

IN LIGHT BALLASTS

Gartner Lee Limited

to: Bruce Donald, P.Eng, Reclamation Manager, Teck Cominco Limited
From: Arlene Laudrum, P.Geol., Remediation Supervisor, Polaris Mine Project
Date: November 24, 2004
ref: 40137
re: **Non-PCBs Light Ballasts, Polaris Mine**

This memo is written to confirm that there were no polychlorinated biphenyl (PCB) containing capacitors in the light ballasts in the accommodation complex, auxiliary trailers or buildings that were demolished in 2003 and 2004.

During the Environmental Site Assessment (ESA) conducted by Gartner Lee Limited in 1999 and 2000 the Maintenance Superintendent and the Electrical Superintendent were interviewed and purchase orders for equipment checked with suppliers in order to confirm that there was no PCB containing equipment at the Polaris Mine. The interviews and purchase order reviews indicated that there was no PCB containing equipment on site. In addition, samples were collected and analyzed for PCBs from electrical transformers. The results of the analysis verified that there were no PCB containing electrical transformers on site.

However, no documentation generated during the ESA specifically discusses the absence of PCB containing light ballasts. Therefore, during the final stages of demolition the capacitor nameplates on twenty-seven (27) lamp ballasts from the accommodation complex, auxiliary trailers and outbuilding buildings were documented to confirm that no PCB containing capacitors were present.

The sample set presented in the following table verifies that no ballasts contained PCBs, as based on Environment Canada Environmental Protection Series Report EPS 2/CC/2 (revised) August 1991 entitled *Identification of Lamp Ballasts Containing PCBs*.

Capacitor Manufacture	Date Code	Manufacture Date	Product Label Statement	Interpretation
Advance	08-19-96	August 19, 1996	NO PCB's	Non-PCB is clearly marked on the capacitor. Advance ballasts manufactured from 1979 onwards do not contain PCB capacitors.
Advance	08-19-96	August 19, 1996	NO PCB's	
Alliance Ballasts	1901	January 1991	NO PCB's	Non-PCB is clearly marked on the capacitor.
Alliance Ballasts	1901	January 1991	NO PCB's	

Capacitor Manufacture	Date Code	Manufacture Date	Product Label Statement	Interpretation
CGE	0805	May 1980		CGE Ballasts manufactured from March 1978 onwards do not contain PCB capacitors.
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	0805	May 1980		
CGE	1809	September 1981		
CGE	0804	April 1980		
CGE	4812	December 1984		
CGE	5810	October 1985		
CGE	0805	May 1980		
CGE	0801	January 1980		
MagneTek	C 92	March 1992	NO PCB's	Non-PCB is clearly marked on the capacitor. MagneTek ballasts manufactured after July 1980 do not contain PCB capacitors
MagneTek	C 92	March 1992	NO PCB's	
MagneTek	C 92	March 1992	NO PCB's	
MagneTek	C 92	March 1992	NO PCB's	
MagneTek	C 92	March 1992	NO PCB's	
Phillips	?		NO PCB's	Non-PCB is clearly marked on the capacitor.
Sola Ballasts	E95	May 1995		Any ballast manufactured by Solo in 1980 or later does not contain PCBs.
Sola Ballasts	E95	May 1995		

In summary, the samples of light ballasts collected during demolition confirm that no PCB containing capacitors were present at the Polaris Mine site during mine demolition.

Arlene Laudrum, P.Geol.
Senior Geologist
GARTNER LEE LIMITED

AL:gc

APPENDIX 7

PROJECT COST REPORT

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
END OF RECLAMATION PHASE COST UPDATE

	BUDGET		Estimate to Complete		End of Project PROJECT COST	
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals
DEMOLITION & RECLAMATION (BARE COSTS)						
MINE EQUIPMENT REMOVAL						
Hazardous Materials Removal	35,845				853	
Mine Refrigeration Plant	145,525				25,639	
Mobile & Mine Equipment	2,919				12,981	
Remove Salvaged Mine Equipment	20,754				-	
Misc Sub Contract Costs	45,957				28,540	
		$ 251,000		$ -		$ 68,013
MINE ACCESS SEALING						
Seal Mine Portals	60,000				20,992	
		$ 60,000		$ -		$ 20,992
CONCENTRATOR BUILDING						
Miscellaneous Materials	22,092				-	
Mill Equipment Clean-Up - Fuels	16,398				-	
Mill Equipment Clean-Up	99,900				40,613	
Hazardous Materials Removal	151,117				94,553	
Barge Demolition	608,592				443,526	
Misc Process Equipment Demolition & Removal	197,432				183,317	
Misc Sub Contract Costs	88,469				84,794	
		$ 1,184,000		$ -		$ 846,803
CONCENTRATE STORAGE STRUCTURE & EQUIPMENT						
Concentrate Storage Equipment Clean-Up	26,117				1,905	
Conveyors	67,600				8,421	
Concentrate Storage Structure & Equipment	555,283				93,654	
		$ 649,000		$ -		$ 103,980
SHIP LOADER & CONVEYOR						
Conveyors	50,000				24,592	
		$ 50,000		$ -		$ 24,592
DOCK & SHORELINE						
Dock & Shoreline Reclamation	869,000				837,739	
		$ 869,000		$ -		$ 837,739
THICKENER & TAILINGS LINES						
Hazardous Materials Removal	22,577				16,452	
Tailings Thickener	377,423				106,677	
		$ 400,000		$ -		$ 123,129
GARROW LAKE						
Garrow Lake Siphons & Lake Drawdown	120,391				195,965	
Dam/Spillway Modifications	95,467				269,662	
Escalation Allowance	3,142				-	
		$ 219,000		$ -		$ 465,627
CRF PLANT STRUCTURE & EQUIPMENT						
CRF Plant Equipment Clean-Up	7,002				1,040	
CRF Plant Equipment Removal	17,533				9,406	
CRF Plant Buildings Demolition	130,455				23,497	
Misc Sub Contract Costs	11,010				46,766	
		$ 166,000		$ -		$ 80,709
ACCOMMODATION COMPLEX STRUCTURE & EQUIPMENT						
Accommodation Complex Building Demolition	249,000				72,318	
		$ 249,000		$ -		$ 72,318
FUEL STORAGE & HANDLING EQUIPMENT						
Miscellaneous Materials	3,681				4,904	
Purge & Decommission Fuel Tanks	53,404				341,959	
Hazardous Materials Removal	50,645				547,319	
Fuel Pumping & Distribution Systems	87,270				11,173	
		$ 195,000		$ -		$ 905,355
BUILDINGS & CONTAINERS						
Miscellaneous Materials	1,323				-	
Misc Warehouse / Shipping Equipment	1,221				3,292	
Misc Buildings Demolition	250,456				100,053	
		$ 253,000		$ -		$ 103,345
MISC CONTRACTOR LABOUR						
Unallocated Labour	133,000				2,310	
		$ 133,000		$ -		$ 2,310
GENERAL SITE GRADING						
Hazardous Materials Removal	44,719				90,114	
General Site Grading & Reclamation	7,129		200,000		702,089	
Escalation Allowance	4,152				-	
		$ 56,000		$ 200,000		$ 792,203

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
END OF RECLAMATION PHASE COST UPDATE

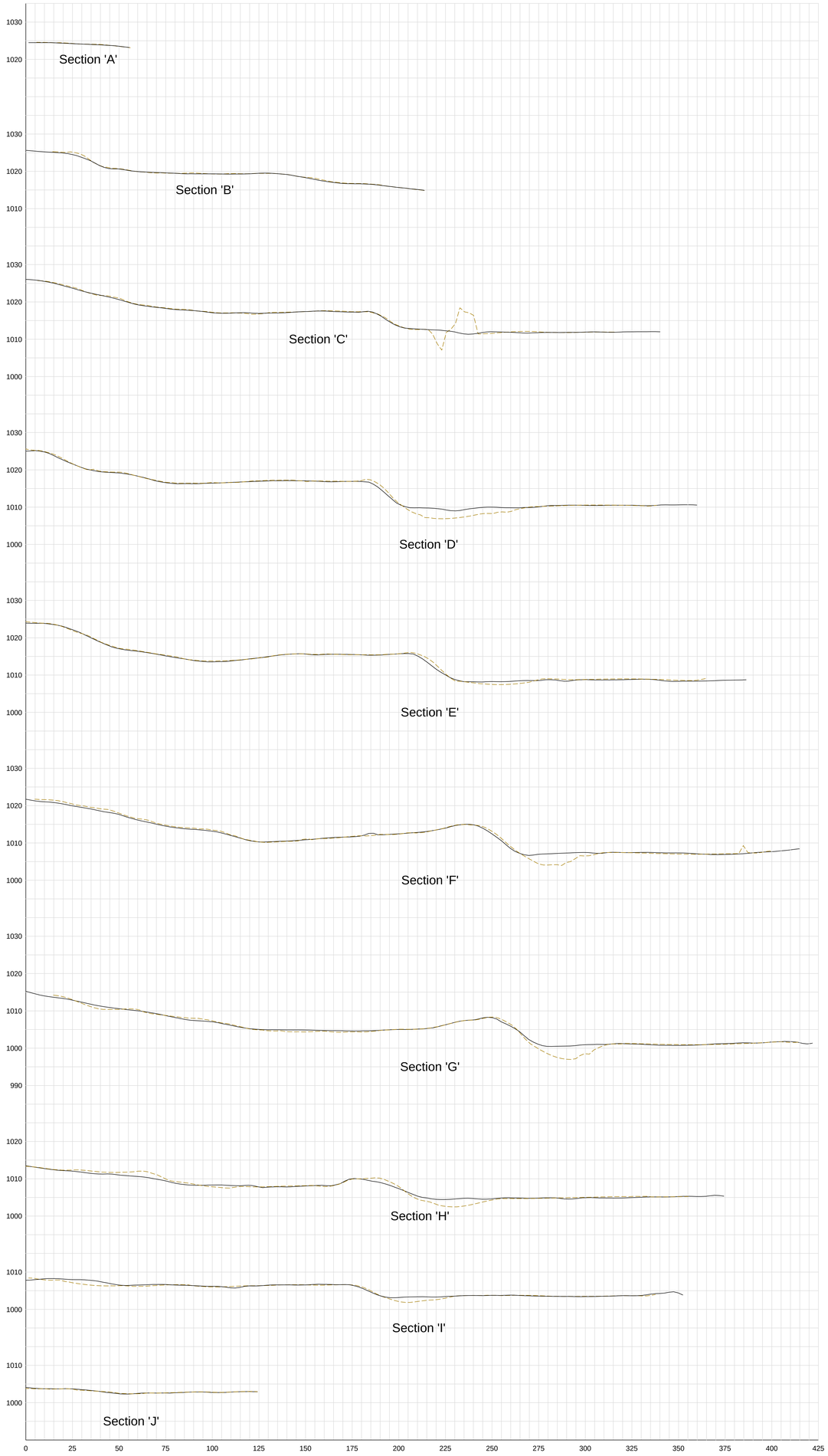
	BUDGET		Estimate to Complete		End of Project PROJECT COST	
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals
LANDFILL RECLAMATION						
Landfill Reclamation	432,000				821,746	
		$ 432,000		$ -		$ 821,746
CONTAMINATED SOILS - CLEANUP						
Metals & Hydrocarbon Contaminated Soils Cleanup & Disposal	366,623				2,627,104	
Hydrocarbon Contaminated Soils (By Polaris)	6,097				13,131	
Metals Contaminated Soils (By Polaris)	173,605				52,382	
U/G Handling & Disposal Of Contaminated Soils	48,675				1,012,154	
		$ 595,000		$ -		$ 3,704,771
QUARRIES & MINE SURFACE RECLAMATION (EARTHWORK)						
Backfill & Re-Contouring	263,000				273,711	
		$ 263,000		$ -		$ 273,711
MISC. DEMOLITION & CLEAN-UP						
Misc Unallocated Clean-Up / Demo	380,000				-	
		$ 380,000		$ -		$ -
EQUIPMENT PURCHASE/RENTAL						
Contractor Equipment Rental	5,274,900				5,216,572	
Contractor Misc Equipment Purchase	719,407				432,906	
Escalation Allowance	59,693				-	
		$ 6,054,000		$ -		$ 5,649,478
MISC. SERVICES & SUPPLIES						
Misc Purchased Materials / Supplies	235,333				536,124	
Escalation Allowance	19,667				-	
		$ 255,000		$ -		$ 536,124
FUEL						
Fuel Supply	3,294,536				4,216,186	
Fuel Taxes (Heating & Power Generation)	68,677				-	
Fuel Taxes (Equipment)	467,343				713,101	
Escalation Allowance	157,444				-	
		$ 3,988,000		$ -		$ 4,929,287
MAINTENANCE OF EQUIPMENT & FACILITIES						
Mobile Equip Maintenance	1,296,759				7,682,560	
Building Maintenance	506,923				2,136,535	
Escalation Allowance	101,318				-	
		$ 1,905,000		$ -		$ 9,819,095
PRE - PURCHASED EQUIPMENT (BY COMINCO)						
Construction Equipment - Purchase (By Owner)	541,000				893,766	
		$ 541,000		$ -		$ 893,766
CONTRACTOR'S FIELD SUPPORT & SUPPLIES						
TRANSPORTATION (SHIPPING)						
Packing & Preparation	85,326				-	
Shipping Costs	948,661				3,411,970	
Escalation Allowance	78,013				-	
		$ 1,112,000		$ -		$ 3,411,970
CONTRACTOR MOB, DEMOB & SUPERVISION						
Contractor Mob/Demob	61,883				208,747	
Contractor Supervisory/Admin Personnel	2,127,339				3,758,445	
Safety Services & Supplies	36,000				521,604	
Misc Temporary Services / Modifications	223,824				1,007,843	
Escalation Allowance	13,954				-	
		$ 2,463,000		$ -		$ 5,496,639
MISC. SERVICES & SUPPLIES						
Communications & TV	374,000				256,412	
Escalation Allowance	31,000				-	
		$ 405,000		$ -		$ 256,412
ACCOMODATIONS						
Catering	1,487,166				2,153,968	
Escalation Allowance	122,834				-	
		$ 1,610,000		$ -		$ 2,153,968
TRAVEL & PERSONNEL						
Travel (Airfares & Expenses)	1,552,881				4,683,561	
Travel Premium - Revised Rotation Schedule	1,072,773				-	
Misc Personnel Transport	72,274				391,547	
Escalation Allowance	575,072				-	
		$ 3,273,000		$ -		$ 5,075,108

POLARIS MINE DECOMMISSIONING, RECLAMATION AND MONITORING COST ESTIMATE
END OF RECLAMATION PHASE COST UPDATE

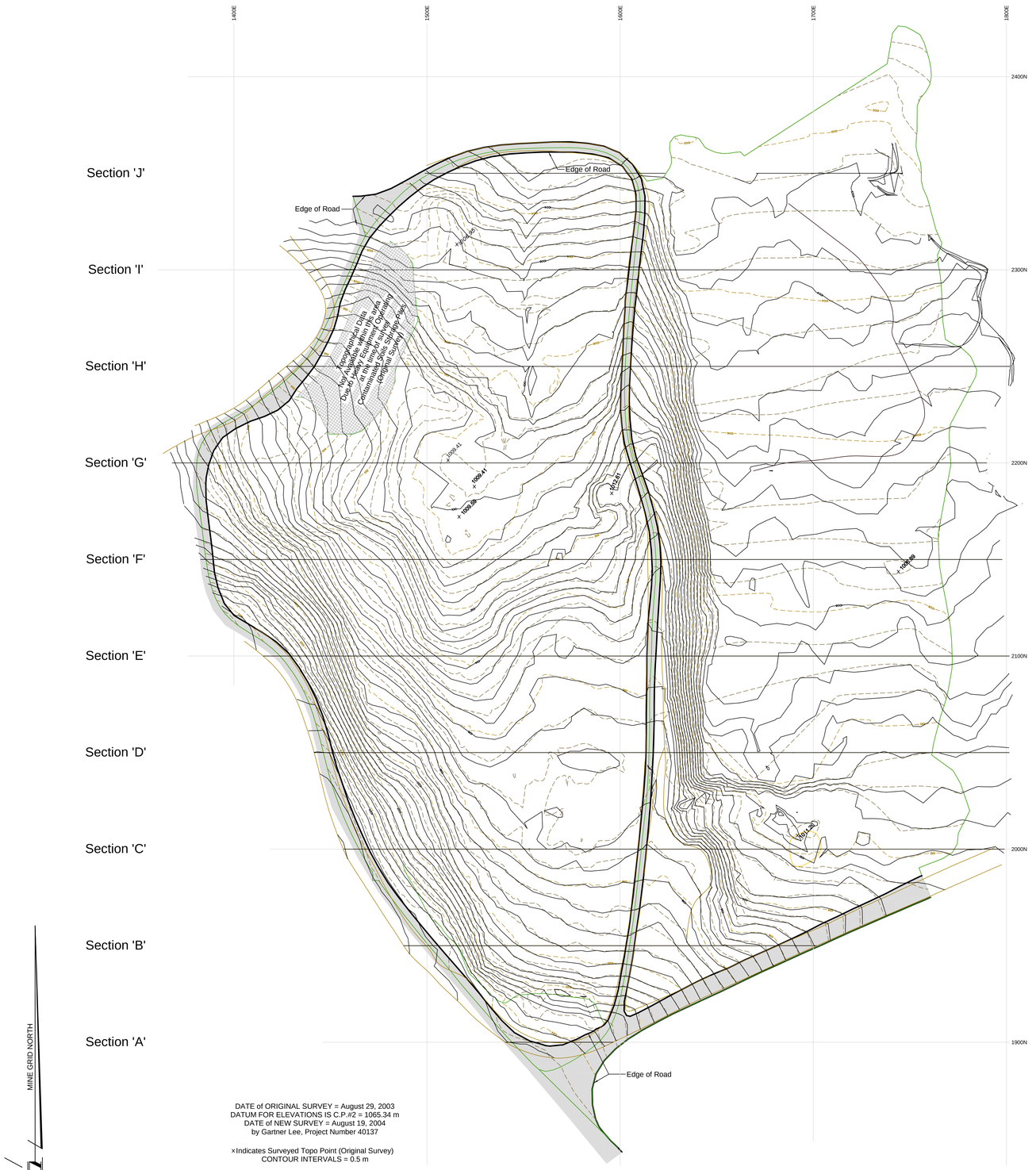
	BUDGET		Estimate to Complete		End of Project PROJECT COST	
	By Code	Subtotals	By Code	Subtotals	By Code	Subtotals
CONTRACTOR INDIRECTS						
HO MOB & DEMOB SUPPORT						
Mob & Demob	1,912,000				1,912,376	
		$ 1,912,000		$ -		$ 1,912,376
CONTRACTOR MANAGEMENT SUPPORT						
Personnel	3,928,932				3,928,932	
Safety & First Aid Personnel to Provide Overlap	184,068				183,644	
		$ 4,113,000		$ -		$ 4,112,576
OTHER CONTRACTOR INDIRECTS						
Contractor's General Indirects	4,952,000				7,470,401	
		$ 4,952,000		$ -		$ 7,470,401
ENGINEERING / PROJECT MANAGEMENT						
ENVIRONMENTAL SITE ASSESMENT						
Environmental Consultants - Site Assesment	275,787				354,711	
Site Assessment - Unallocated	207,874				105,263	
Escalation Allowance	2,339				-	
		$ 486,000		$ -		$ 459,974
CLOSURE PLAN						
Environmental Consultants - Closure Plan	415,772				372,272	
Escalation Allowance	2,228				-	
		$ 418,000		$ -		$ 372,272
ENGINEERING / SPECIAL CONSULTANTS						
Design Consultants - Dock / Loadout	1,316				1,320	
Design Consultants - Tailings / Garrow Lake	3,520				3,515	
Design Consultants - Dock / Loadout	79,684				65,354	
Design Consultants - Tailings / Garrow Lake	54,780				45,328	
Sitework & Demolition Procedures - Design Services	18,300				46,825	
Escalation Allowance	2,400				-	
		$ 160,000		$ -		$ 162,342
PROJECT MANAGEMENT CONSULTANT (HO STAFF)						
Project Management - Salaries	411,069				1,289,847	
Project Management - Reimb Expenses	100,000				85,492	
Escalation Allowance	31,931				-	
		$ 543,000		$ -		$ 1,375,339
CONSTRUCTION MANAGEMENT (FIELD STAFF)						
Construction Management - Salaries	2,142,878				1,915,004	
Escalation Allowance	179,122				-	
		$ 2,322,000		$ -		$ 1,915,004
ENVIRONMENTAL TESTING AND SAMPLING						
Environmental Reclamation Supervision - Staff	337,123				1,038,747	
Escalation Allowance	29,550				-	
Environmental Reclamation Supervision - Testing	330,000				171,498	
Additional Sampling and Consultant Services (MMER)	0				354,386	
Escalation Allowance	26,327				-	
		$ 723,000		$ -		$ 1,564,631
OWNER'S COSTS						
SALARIES & EXPENSES						
Teck Cominco HO Proj Mgmnt (Staff Lab)	374,631				476,911	
Teck Cominco HO Proj Mgmnt (Misc Material & Exp)	199,149				221,031	
Escalation Allowance	34,220				-	
		$ 608,000		$ -		$ 697,942
OVERHEAD / HO SUPPORT						
Land Leases, Licences	175,000				96,979	
Miscellaneous Permits	45,000				16,889	
Insurance	445,900				319,459	
Property Taxes	495,000				180,412	
Home Office General Admin (Labour & Exp)	722,384				16,700	
Public Relations	74,292				58,718	
Legal	57,540				48,421	
Escalation Allowance	168,560				-	
Misc Owner's Overhead	6,324				13,882	
		$ 2,190,000		$ -		$ 751,460
GENERAL ADMIN						
Closure Management - Polaris Personnel	54,000				-	
Escalation Allowance	2,880				-	
Closure Wrap Up	5,120				-	
		$ 62,000		$ -		$ -
POST RECLAMATION COSTS (2005 - 2011)						
SITE MONITORING AND HOLDING COSTS						
Annual Post Closure Environmental Monitoring (2005 to 2011)	510,000		510,000		510,000	
Final Sampling Program, Data Evaluation and Reporting in 2011	160,000		160,000		160,000	
Land Lease/Licence costs from 2005 to 2011	126,000		126,000		126,000	
Property Taxes - 2005 to 2011	70,000		70,000		70,000	
Escalation Allowance	135,000		135,000		135,000	
		$ 1,001,000		$ 1,001,000		$ 1,001,000
UNALLOCATED						
Uncoded Forecast Cost Adjustments (Net)	-		-		-	
		$ -		$ -		$ -
TOTAL DECOMMISSIONING / RECLAMATION & MONITORING COSTS		**$ 47,500,000**		**$ 1,201,000**		**$ 69,264,507**

APPENDIX 8

ANNUAL SUBSIDENCE SURVEY



Vertical Scale 1:500
Horizontal Scale 1:1000



DATE of ORIGINAL SURVEY = August 29, 2003
DATUM FOR ELEVATIONS IS C.P.#2 = 1065.34 m
DATE of NEW SURVEY = August 19, 2004
by Gartner Lee, Project Number 40137

×Indicates Surveyed Topo Point (Original Survey)
CONTOUR INTERVALS = 0.5 m

TOPOGRAPHIC SURVEY of Subsidence Area Polaris Mine Nunavut

teckcominco

DATE	REVISIONS	DR/CK
Jan. 04/05	Added Survey Data by Gartner Lee	TT/CT

FOCUS Focus Surveys
A DIVISION OF THE FOCUS CORPORATION LTD.
Edmonton (780) 466-6555
Calgary (403) 269-2252
Grande Prairie (780) 539-3222
Medicine Hat (403) 527-3707
Regina (306) 586-0837
Fort St John (250) 785-7776

Drawn by : TT	Chk'd by : CT
Date : January 04, 2005	Scale: 1:1000
Job : 322789-00	FILE No.
Dwg : 322789-01-topo.dwg	Sheet 1 of 1

APPENDIX 9

CLARIFICATION OF REMEDIATION

OF CONTAMINATED SOIL

AT THE

CONCENTRATE STORAGE SHED

Gartner Lee Limited

to: Bruce Donald, P.Eng, Reclamation Manager, Teck Cominco Limited
from: Arlene Laudrum, P.Geol., Remediation Supervisor, Polaris Mine Project
date: January 9, 2006
ref: 50063
re: **Request for Clarification of Remediation of Contaminated Soil at the Polaris Mine's former Concentrate Storage Shed**

Further to the Nunavut Water Board ("NWB") and Indian and Northern Affairs Canada ("INAC") letter dated June 2, 2004 reviewing the Teck Cominco Limited's (the "Licensee") 3rd and 4th Quarter Reports, in which clarification of the following issue was requested:

- The estimated quantity of concentrate remaining in the footprint, its potential mobility, proximity to the ocean and toxicity concerns.
- The approach to monitoring the site post-closure.

The former Concentrate Storage Shed area was located south of the Process Barge and shiploading Dock. The building was demolished in August 2003. Removal of soil impacted with the lead and zinc concentrate commenced thereafter, with the soil beneath the footprint of the former Concentrate Storage Shed being excavated in 2003. The area remediated in 2003 was roughly 20 000 m^2. Approximately 8 000 m^2 or 40% of this area was excavated to expose fractured limestone bedrock.

Sampling of the soil remaining within the fractured bedrock revealed that the remedial excavation method used had resulted in lead and zinc concentrate dust blending with the underlying soil and infiltrating the rock. Lead concentrations obtained from composite floor samples collected across the area of bedrock ranged from 221 mg/kg to 23 300 mg/kg and zinc concentrations ranged from 1 290 mg/kg to 34 100 mg/kg.

Estimated Quantity of Concentrate Remaining

Confirmation soil samples collected from the residual soil remaining within the fractured bedrock exceeded the Polaris Mine Soil Quality Remediation Objectives (SQROs) of 2 000 mg/kg lead and 10 000 mg/kg zinc for approximately 70% of the exposed rock area, or some 5 500 m^2. The amount of residual soil remaining within the fractured bedrock varies throughout this area. A maximum of 10 cm of residual soils remained in sporadic locations over and within the bedrock. Based on this maximum depth, and ignoring the fact that the presence of residual soil was sporadic, it is estimated that there remains no more than 550 m^3 of soil impacted with lead and zinc concentrate dust that exceeds the SQROs.

Potential Mobility
The contaminated soil has been isolated under a durable cover of more than 0.5 m in thickness. The cover constructed in 2003 was composed of native gravels with a suitable gradation to resist erosion from wind and surficial runoff.

In 2004, the hillside upslope of the former Concentrate Storage Shed was recontoured to inhibit erosion across the former Concentrate Storage Shed footprint and to blend in the slope with the shoreline. This recontouring resulted in additional fill being placed over the areas with the higher residual concentrations of lead and zinc in the soil. These areas were adjacent to the former east wall of the Concentrate Storage Shed.

Proximity to the Ocean.
The area with soil concentrations exceeding the SQROs is greater than 100 metres from the ocean. Excavation of the remaining contaminated soil along the south shore surrounding the Concentrate Storage Shed was completed to meet the Polaris Mine SQROs by July 2004 and is reported on in the South Shore close-out report.

Post Closure Monitoring
It is recommended that physical stability of the soil cover in this area be included in the annual site geotechnical inspection to ensure that any erosion of the cover is identified. The area being discussed is relatively flat, therefore the potential for erosion is considered minimal. If monitoring were to identify any signs of erosion Teck Cominco has indicated it would undertake repairs and upgrade the cover of the affected area.

To confirm that there is no trend of increasing lead and zinc concentrations in the soil cover over time, it is also recommended that soil samples be collected at several locations at the area being discussed on an annual basis during the closure-monitoring period. Teck Cominco has indicated that mitigation measures will be undertaken should the metal concentrations be increasing.

In summary, the volume of soil that exceeds the SQROs is less than 550 m^3. A small volume considering the extensive remediation activities undertaken at the Polaris Mine site. To reduce the potential for the residual zone of contamination to pose a threat to the environment it has been buried under a durable cover more than 0.5 m in thickness and the area has been recontoured to inhibit erosion of the cover. In addition the zone of contamination is greater than 100 m from the ocean boundary.

AL:al

APPENDIX 10

RECORD of DEBRIS

PLACED INTO

LITTLE RED DOG QUARRY LANDFILL

PLACEMENT OF DEBRIS INTO LRD QUARRY LANDFILL

2004 - Final Report

DRAWINGS OF DEBRIS PLACEMENT

Relatively little debris was placed into Little Red Dog Quarry Landfill (LRDQL) during 2004. Demolition of the two largest structures on the site had been previously completed in 2003 (the Concentrate Storage Building and Barge). While a number of buildings were demolished, Apart from the Accommodations Complex the other buildings were relatively small. Structures demolished in 2004 included the Accommodations Complex, Fuel Tank Farm, Foldaway Buildings (3), Cat Generator Building, the Dock Cells, and various storage containers and scrap equipment were the main sources of debris for 2004. The attached three drawings indicate the areas where debris was placed in the 1st Quarter, the 2nd Quarter and the 3rd Quarter (the end of the 3rd Quarter really represents the end of the project work which ended September 7th). The locations shown on the drawings represent the final placement locations and not temporary staging areas.

The drawings show the 5th and 6th Lifts (L5 and L6) of debris placed in the quarry. Each area is dated, for example'L6-2005-08' represents Lift 6, for the month of August 2005.

RECORD OF WASTE SOURCE/VOLUME AND TYPE

Following the placement drawings is a listing by day showing the source of the debris, type of debris, where it was hauled to, and the quantity of debris.

VERIFICATION OF HYDROCARBON REMOVAL

For equipment disposed of either in LRD or underground, each individual piece of equipment that contains hydrocarbons (or other hazardous materials), under went removal of these substances before being disposed of. The mechanic doing the work completes the check sheet documenting that the equipment has been properly prepared for disposal. Copies of the equipment preparation sheets are attached.

PHOTOGRAPHIC RECORD

As specified in the Closure Plan, a photographic record of debris placement was maintained. Attached to this appendix are pictures of typical debris being placed in LRDQL. As there was less debris placed into LRDQL during the year, fewer pictures were taken than in the previously. Lack of light prevented pictures from being taken in January but there was essentially no building debris generated during January or February.

BORROW

RAMP

HAUL ROAD INTO PIT

998
Tripod

L5-2004-03

L5-2004-03

RAMP

Bench 7 @ 1011.0m

Bench 6 @ 1018.5m

Bench 5 @ 1026.0m

Bench 4 @ 1033.5m

Bench 3 @ 1041.0m

Bench 2 @ 1048.5m

Bench 1 @ 1056.0m

Bench A @ 1063.5m

63
WMLRD2032

69
BSAS

550 E 575 E 600 E 625 E 650 E 675 E 700 E 725 E 750 E 775 E 800 E 825 E 850 E 875 E 900 E

2275 N 2250 N 2225 N 2200 N 2175 N 2150 N 2125 N 2100 N 2075 N

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POLARIS PROJECT

LRD Quarry – LIFT 05

Demolition Debris Placement

DRAWN BY:	SCALE:	DATE:	DWG #:
TSF	NTS	MAR-2004	

BORROW

RAMP

HAUL ROAD INTO PIT

998
Tripod

L6-2004-05

L6-2004-04

L6-2004-06

RAMP

Bench 7 @ 1011.0m

Bench 6 @ 1018.5m

Bench 5 @ 1026.0m

Bench 4 @ 1033.5m

Bench 3 @ 1041.0m

Bench 2 @ 1048.5m

Bench 1 @ 1056.0m

Bench A @ 1063.5m

WMLRD2002

BSAS

550 E 575 E 600 E 625 E 650 E 675 E 700 E 725 E 750 E 775 E 800 E 825 E 850 E 875 E 900 E

2275 N 2250 N 2225 N 2200 N 2175 N 2150 N 2125 N 2100 N 2075 N

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POLARIS PROJECT

LRD Quarry – LIFT 06

Demolition Debris Placement

DRAWN BY:	SCALE:	DATE:	DWG #:
TSF	NTS	JUN–2004	

R:\37 – RECLAMATION PLANNING/37.02 Contaminated Soil/LRD Debris Placement

BORROW

RAMP

HAUL ROAD INTO PIT

998
Tripod

L6-2004-05

L6-2004-04

L6-2004-08

L6-2004-07

L6-2004-06

RAMP

Bench 7 @ 1011.0m

Bench 6 @ 1018.5m

Bench 5 @ 1026.0m

Bench 4 @ 1033.5m

Bench 3 @ 1041.0m

Bench 2 @ 1048.5m

Bench 1 @ 1056.0m

Bench A @ 1063.5m

WMLRD2002

BSAS

550 E 575 E 600 E 625 E 650 E 675 E 700 E 725 E 750 E 775 E 800 E 825 E 850 E 875 E 900 E

2275 N 2250 N 2225 N 2200 N 2175 N 2150 N 2125 N 2100 N 2075 N

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POLARIS PROJECT

LRD Quarry – LIFT 06

Demolition Debris Placement

DRAWN BY:	SCALE:	DATE:	DWG #:
TSF	NTS	DEC–2004	

R:\37 – RECLAMATION PLANNING/37.02 Contaminated Soil/LRD Debris Placement

POLARIS MINE DEBRIS DISPOSAL IN LITTLE RED DOG QUARRY LANDFILL - 2004

Date	Origin	Disposal	Material	Quantity (m3)
8-Mar-04	Garrow Dam	L-R-D	Frozen Core	185
10-Mar-04	Garrow Dam	L-R-D	Frozen Core	180
14-Mar-04	Foldaway	L-R-D	Steel	6
27-Mar-04	Garrow Dam [stockpile]	L-R-D	Sand/Gravel	72
30-Mar-04	Garrow Dam	L-R-D	Frozen Core	585
6-Apr-04	Garrow Dam [stockpile]	L-R-D	Frozen Core	57
7-Apr-04	Garrow Dam [stockpile]	L-R-D	Frozen Core	312
8-Apr-04	Garrow Dam [stockpile]	L-R-D	Frozen Core	859
9-Apr-04	Garrow Dam [stockpile]	L-R-D	Frozen Core	106
11-Apr-04	Barge	L-R-D	Debris	117
13-Apr-04	Dock	L-R-D	Steel	45
14-Apr-04	Shoreline	L-R-D	Debris	10
20-Apr-04	Accommodation	L-R-D	Debris	20
20-Apr-04	Shoreline	L-R-D	Steel	18
23-Apr-04	Burn Pit	L-R-D	Steel	10
25-Apr-04	Dock	L-R-D	Sheet Pile	78
26-Apr-04	Incinerator	L-R-D	Snow w/ debris	60
27-Apr-04	Foldaway	L-R-D	Debris	10
27-Apr-04	Shoreline	L-R-D	Styrofoam	24
28-Apr-04	Foldaway	L-R-D	Snow w/ debris	270
29-Apr-04	Dock	L-R-D	Sheet Pile	36
29-Apr-04	Foldaway	L-R-D	Snow w/ debris	120
1-May-04	Fire Hall	L-R-D	Debris	10
2-May-04	Ball Field	L-R-D	Debris	10
4-May-04	Fire Hall	L-R-D	Snow w/ debris	40
5-May-04	Fire Hall	L-R-D	Snow w/ debris	110
6-May-04	Dock	L-R-D	Sheet Pile	90
12-May-04	Ball Field	L-R-D	Debris	29
13-May-04	Ball Field	L-R-D	Debris	10
14-May-04	Ball Field	L-R-D	Debris	10
14-May-04	Dock	L-R-D	Styrofoam	10
15-May-04	Dock	L-R-D	Debris	29
22-May-04	Fire Hall	L-R-D	Steel	442
25-May-04	Dock	L-R-D	Sheet Pile	284
29-May-04	L-R-D [notch]	L-R-D	Sand/Gravel	244
1-Jun-04	Ball Field	L-R-D	Debris	59
2-Jun-04	Foldaway	L-R-D	Debris	20
4-Jun-04	Foldaway	L-R-D	Debris	10
6-Jun-04	Foldaway	L-R-D	Debris	20
10-Jun-04	Dock	L-R-D	Sheet Pile	14
11-Jun-04	North Portal	L-R-D	Debris	10
11-Jun-04	Dock	L-R-D	Sheet Pile	18
12-Jun-04	Foldaway	L-R-D	Concrete	29
12-Jun-04	Foldaway	L-R-D	Steel	585
13-Jun-04	Foldaway	L-R-D	Concrete	128
13-Jun-04	Bone Yard	L-R-D	Debris	98
13-Jun-04	Foldaway	L-R-D	Steel	30
14-Jun-04	Bone Yard	L-R-D	Debris	10
15-Jun-04	Foldaway	L-R-D	Concrete	49
15-Jun-04	Foldaway	L-R-D	Steel	790
16-Jun-04	Foldaway	L-R-D	Debris	322
16-Jun-04	Dock	L-R-D	Sheet Pile	42
17-Jun-04	Foldaway	L-R-D	Concrete	199
19-Jun-04	CRF Plant	L-R-D	Debris	18

POLARIS MINE DEBRIS DISPOSAL IN LITTLE RED DOG QUARRY LANDFILL - 2004

Date	Origin	Disposal	Material	Quantity (m3)
21-Jun-04	Conc. Shed	L-R-D	Concrete	26
24-Jun-04	North Portal	L-R-D	Debris	10
24-Jun-04	Barge	L-R-D	Steel	144
25-Jun-04	Barge	L-R-D	Debris	72
25-Jun-04	Barge	L-R-D	Steel	180
26-Jun-04	Barge	L-R-D	Concrete	36
26-Jun-04	Barge	L-R-D	Debris	132
26-Jun-04	Barge	L-R-D	Steel	90
27-Jun-04	Barge	L-R-D	Concrete	388
27-Jun-04	Foldaway	L-R-D	Debris	59
27-Jun-04	Barge	L-R-D	Steel	560
28-Jun-04	Barge	L-R-D	Steel	18
30-Jun-04	Conc. Shed	L-R-D	Steel	98
1-Jul-04	Conc. Shed	L-R-D	Steel	29
2-Jul-04	Conc. Shed	L-R-D	Steel	176
3-Jul-04	Conc. Shed	L-R-D	Steel	38
4-Jul-04	Conc. Shed	L-R-D	Debris	29
4-Jul-04	Conc. Shed	L-R-D	Steel	20
5-Jul-04	Foldaway	L-R-D	Steel	14
6-Jul-04	Conc. Shed	L-R-D	Steel	77
7-Jul-04	Conc. Shed	L-R-D	Steel	98
8-Jul-04	Barge	L-R-D	Debris	10
11-Jul-04	Foldaway	L-R-D	Debris	127
12-Jul-04	Tank Farm	L-R-D	Steel	156
13-Jul-04	Tank Farm	L-R-D	Steel	254
15-Jul-04	Warehouse	L-R-D	Steel	78
16-Jul-04	Ball Field	L-R-D	Debris	20
17-Jul-04	Conc. Shed	L-R-D	Debris	38
18-Jul-04	Airstrip	L-R-D	Debris	10
19-Jul-04	Ball Field	L-R-D	Debris	10
19-Jul-04	Warehouse	L-R-D	Steel	16
20-Jul-04	North Portal	L-R-D	Debris	29
21-Jul-04	Bone Yard	L-R-D	Debris	82
22-Jul-04	Warehouse	L-R-D	Debris	57
23-Jul-04	Ball Field	L-R-D	Debris	29
23-Jul-04	Warehouse	L-R-D	Steel	113
27-Jul-04	Ball Field	L-R-D	Debris	10
29-Jul-04	North Portal	L-R-D	Steel	90
30-Jul-04	Main Portal	L-R-D	Steel	410
30-Jul-04	Conc. Shed	L-R-D	Tailing line	56
31-Jul-04	Garrow Dam	L-R-D	Steel	16
31-Jul-04	Conc. Shed	L-R-D	Tailing line	251
1-Aug-04	Main Portal	L-R-D	Debris	134
1-Aug-04	Bone Yard	L-R-D	Steel	156
3-Aug-04	Ball Field	L-R-D	Cement	294
3-Aug-04	Ball Field	L-R-D	Debris	39
3-Aug-04	Ball Field	L-R-D	Steel	42
5-Aug-04	Accommodation	L-R-D	Debris	8
5-Aug-04	Accommodation	L-R-D	Steel	314
6-Aug-04	Accommodation	L-R-D	Steel	1344
7-Aug-04	Accommodation	L-R-D	Debris	560
7-Aug-04	Accommodation	L-R-D	Steel	1283
8-Aug-04	Accommodation	L-R-D	Debris	530
8-Aug-04	Accommodation	L-R-D	Steel	958

POLARIS MINE DEBRIS DISPOSAL IN LITTLE RED DOG QUARRY LANDFILL - 2004

Date	Origin	Disposal	Material	Quantity (m3)
9-Aug-04	Accommodation	L-R-D	Debris	508
9-Aug-04	Barge	L-R-D	Steel	333
10-Aug-04	Accommodation	L-R-D	Debris	824
10-Aug-04	Accommodation	L-R-D	Steel	488
11-Aug-04	Accommodation	L-R-D	Debris	944
11-Aug-04	Accommodation	L-R-D	Steel	442
12-Aug-04	Accommodation	L-R-D	Debris	664
12-Aug-04	Accommodation	L-R-D	Steel	340
13-Aug-04	Accommodation	L-R-D	Debris	688
13-Aug-04	Incinerator	L-R-D	Steel	640
14-Aug-04	Accommodation	L-R-D	Concrete	120
14-Aug-04	Accommodation	L-R-D	Debris	512
14-Aug-04	Ball Field	L-R-D	Steel	80
15-Aug-04	Accommodation	L-R-D	Concrete	124
15-Aug-04	Accommodation	L-R-D	Debris	200
16-Aug-04	Water Tank	L-R-D	Debris	39
17-Aug-04	Accommodation	L-R-D	Concrete	116
17-Aug-04	Main Portal	L-R-D	Debris	91
17-Aug-04	Frustration Lake	L-R-D	Steel	16
18-Aug-04	Accommodation	L-R-D	Concrete	28
18-Aug-04	Shoreline	L-R-D	Debris	65
19-Aug-04	Ball Field	L-R-D	Debris	20
19-Aug-04	CRF Plant	L-R-D	Steel	78
20-Aug-04	North Portal	L-R-D	Debris	88
20-Aug-04	L-R-D	L-R-D	Rock / Stone	1400
20-Aug-04	Beach	L-R-D	Steel	36
21-Aug-04	CRF Plant	L-R-D	Debris	24
21-Aug-04	L-R-D	L-R-D	Rock / Stone	3634
21-Aug-04	Tank Farm	L-R-D	Steel	178
22-Aug-04	CRF Plant	L-R-D	Debris	26
22-Aug-04	L-R-D	L-R-D	Rock / Stone	5040
22-Aug-04	Tank Farm	L-R-D	Steel	54
23-Aug-04	L-R-D	L-R-D	Rock / Stone	7165
24-Aug-04	L-R-D	L-R-D	Rock / Stone	8514
25-Aug-04	L-R-D	L-R-D	Rock / Stone	4170
26-Aug-04	North Portal	L-R-D	Debris	8
26-Aug-04	L-R-D	L-R-D	Rock / Stone	3764
26-Aug-04	CRF Plant	L-R-D	Steel	128
27-Aug-04	L-R-D	L-R-D	Rock / Stone	1136
27-Aug-04	CRF Plant	L-R-D	Steel	64
28-Aug-04	Tank Farm	L-R-D	Debris	36
28-Aug-04	L-R-D	L-R-D	Rock / Stone	792
29-Aug-04	L-R-D	L-R-D	Rock / Stone	384
30-Aug-04	Water Tank	L-R-D	Steel	138
31-Aug-04	Ball Field	L-R-D	Debris	184
31-Aug-04	Water Tank	L-R-D	Steel	128
1-Sep-04	Ball Field	L-R-D	Debris	160
1-Sep-04	L-R-D [notch]	L-R-D	Sand/Gravel	1078
2-Sep-04	CRF Plant	L-R-D	Debris	92
2-Sep-04	L-R-D	L-R-D	Rock / Stone	2264
3-Sep-04	L-R-D	L-R-D	Rock / Stone	540

CHECK SHEETS

FOR

EQUIPMENT

BEING PREPARED

FOR

BURIAL

STATIONARY EQUIPMENT LUBR[illegible]T EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
June 29/04	Seasons	POZZUTEC 20	CEMENT ACCELERATOR	1,230 LT	UNDERGROUND	(CB)	[illegible]	

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Pola[redacted]in[redacted]site Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & [redacted]ractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
	TANK FARM	#2 SHORE TANK	DIESEL FUEL.		INCINERATOR		[redacted]	[redacted]
	Clone By	Smit Tank						
	TANK FARM	OLD GAS TANK Bent Horn TANK	WATER Bent Horn Crude Diesel		INCINERATOR		[redacted]	[redacted]

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
Aug 5,04	ACCOMODATIONS	GLYCOL PIPING	PROPYLENE		INCINERATOR			
		AND HEAT EXCHANGERS	GLYCOL					
Aug 6.04	ACCOMODATIONS	SEWAGE PUMP	OIL	3QTS	INCINERATOR			
Aug 6.04	ACCOMODATIONS	FW PUMP 1	N/A	SEALED	N/A			
		FW PUMP 2	N/A	〃	〃		〃	
		FW PUMP 3	N/A	〃	〃		〃	

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polar [redacted]site Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & [redacted]ractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
June 29/04		135 426 4/6 Truck			930 Level 4/6	CB	PS	
		"	All oils		Incinerator	CB	PS	
		"	Fuel		"	CB	PS	
			~~air cooled~~ engine Coolant		"	CB	PS	
June 28/04		108 Scoop			930 level 4/6	CB	PS	
		"	All oil			CB	PS	
		"	Fuel			CB	PS	
		"	~~air cooled~~ engine Coolant			CB	PS	

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Contractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner Rep
SEPT 17/03		250 TRUCK (LRD)	ALL OILS	30 litres	FUTURE INCINERATION	CB		
			FUEL	25 litres	" "	CB		
			Coolant	15 litres	" "	CB		
MAY 2/03		752 TOYOTA (LRD)	ALL OILS	5 litres	" "	CB		
			FUEL	13 litres	" "	CB		
			Coolant	6 litres	" "	CB		
JUNE 2/05		740 TOYOTA (LRD)	ALL OILS	5 litres	" "	CB		
			FUEL	17 litres	" "	CB		
			Coolant	7 litres	" "	CB		
JUNE 3/04		111 SCOOP (UG)	ALL OILS		" "	CB		
			FUEL		" "	CB		
			~~air cooled~~ ~~Coolant~~ engine		" "	CB		
JUNE 22/04		3 TOYOTA ENGINE BLOCK	ALL OILS	15 litres	" "	CB		
			Fuel lines	N/A	" "	CB		
JUNE 16/04		2 12 cylinder DEUTZ Engines	OILS	20 litres	" "	CB		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Contractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
June 27/04		316 ANFO TRUCK			AB SCRAM U/G	CR	PS	
		"	ALL OILS		INCINERATOR	CR	PS	
			FUEL		"	CR	PS	
			COOLANT		"	CR	PS	
JUNE 30/04		ANFO - PLANT			U/G	CR	PS	
		" "	FUEL		INCINERATOR	CR	PS	
			ALL OIL		"	CR	PS	
June 25/04		152 JUMBO			AB SCRAM U/G	CR	PS	
		"	ALL OILS		INCINERATOR	CR	PS	
		"	FUELS		"	CR	PS	
		"	COOLANT		"	CR	PS	
June 30/04		133 426 U/G TRUCK			930 LEVEL U/G	CR	PS	
		"	ALL OILS		INCINERATOR	CR	PS	
		"	FUEL		"	CR	PS	
			COOLANT		"	CR	PS	
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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Pola[illegible]lin[illegible]site Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & [illegible]ractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
June 4/04		763 TOYOTA (LRD)	ALL OILS	5 litres	FUTURE INCINERATOR	CB	PS	
			FUEL	12 litres	" "	CB	PS	
			Coolant	5 litres	" "	CB	PS	
June 4/04		753 TOYOTA (LRD)	ALL OILS	5 litres	" "	CB	PS	
			FUEL	12 litres	" "	CB	PS	
			Coolant	6 litres	" "	CB	PS	
APR 28/04		196 COMPRESSOR (LRD)	ALL OILS	14 litres	" "	CB	PS	
			Fuel	27 litres	" "	CB	PS	
			Coolant	10 litres	" "	CB	PS	
APR 28/04		964 WELDER (LRD)	FUEL	20 litres	" "	CB	PS	
			OIL	8 litres	" "	CB	PS	
SEPT 16/03		258 TRUCK (LRD)	ALL OILS	30 litres	" "	CB	PS	
			Fuel	40 litres	" "	CB	PS	
			Coolant	15 litres	" "	CB	PS	
June 5/04		700 TOYOTA	ALL OIL	5 litres	" "	CB	PS	
			FUEL	17 litres		CB	PS	
			coolant	6 litres		CB	PS	

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Pula... In-Site Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Contractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
MAY 31/02		206 W 20 CASE Loader (Sink Hole)	ALL OIL	4 Litres	Future Incinerati	CB	PS	
			FUEL	10 litres	" "	CB	P	
			Coolant	5 litres	" "	CB	PS	
MAY 31/04		662 TOYOTA (LRD)	ALL OIL	4 litres	" "	CB	P	
			Fuel	5 GALS	" "	CB	P	
			Coolant	3 litres	" "	CB	P	
JUNE 4/04		659 TOYOTA (LRD)	ALL OILS	4 litres	" "	CB	PS	
			FUEL	12 litres	" "	CB	PS	
			Coolant	3 litres	" "	CB	PS	
JUNE 5/04		655 TOYOTA (LRD)	ALL OILS	4 litres	" "	CB	PS	
			FUEL	7 litres	" "	CB	PS	
			Coolant	3 litres	" "	CB	PS	
JUNE 5/04		741 TOYOTA (LRD)	ALL OILS	4 litres	" "	CB	P	
			FUEL	10 litres	" "	CB	PS	
			Coolant	4 litres		CB	PS	
						—		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

Disposal Facility

SNC-LAVALIN Engineers & Contractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
June 7/04		746 TOYOTA (LRD)	ALL OILS	4 litres	" "	CB		
			FUEL	15 litres	" "	CB		
			Coolant	5 litres	" "	CB		
June 1/04		653 TOYOTA (LRD)	ALL OILS	4 litres	" "	CB		
			FUEL	8 litres	" "	CB		
			Coolant	4 litres	" "	CB		
June 5/04		737 TOYOTA (LRD)	ALL OILS	5 litres	" "	CB		
			FUEL	15 litres	" "	CB		
			Coolant	5 litres	" "	CB		
June 5/04		744 TOYOTA (LRD)	ALL OILS	5 litres	" "	CB		
			FUEL	17 litres	" "	CB		
			Coolant	5 litres	" "	CB		
June 4/04		Dodge RAM TRUCK (LRD)	ALL OILS	8 litres	" "	CB		
			FUELS	23 litres	" "	CB		
			Coolant	7 litres	" "	CB		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	MAIN MINE ENTRANCE	#1 MINE COOLING UNIT	FREON 22	300 16's		TUNDRA		
		SERIAL # 5,651.723						
			10 GAL. OIL	10 GAL.	INCINERATOR	TUNDRA.		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	main mine entrance	#2 mine cooling unit	Freon 22	400 lbs		Tundra		
		serial # 5.651.721						
			oil	10 gal.	incinerator	Tundra.		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
06/07/04	Main mine entrance	#3 mine Cooling Unit	Freon 22	400 lbs		Tundra		
		Serial # 5.651.724						
			10 gal. oil	10 gal.	incinerator	Tundra		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	MAIN mine entrance	#4 mine cooling unit	Freon 22	340lbs		Tundra.		
		serial # 5.651.722						
			10gal oil	10gal.	incenerator	Tundra.		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Pula ...inesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & ...ractors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
June 15/16/04	POWERHOUSE	#5 CAT GENERATOR	ALL OILS	820 LT	INCINERATOR	CB	PS	
	"	"	GLYCOL/WATER 60/40	410 LT	"	CB	PS	
		#6 CAT GENERATOR	ALL OILS	820 LT	"	CB	PS	
		"	GLYCOL/WATER 60/40	410 LT	"	CB	PS	
		Fuel lines on ENGINES	FUEL	205 LT	"	CB	PS	
	"	GLYCOL FROM HEATERS & PIPING	GLYCOL 50/50	205 LT	"	CB	PS	
	BENTHORN BUILDING	Fuel tank, lines	FUEL	205 LT	"	CB	PS	
		OILS & GLYCOL	OILS & GLYCOL	205 LT	"	CB	PS	
	TANK FARM BENTHORN TANK							

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EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

29-04-04

UNIT #: 135 DATE OF DRAINING: 29-04-04

UNIT DESCRIPTION: JDT 426 U/G TRUCK

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol	X	✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: JUNE 30th 04

DISPOSAL LOCATION: SENT TO NORTH PORTAL FOR U/G DISPOSAL

BENCH LEVEL:

U/G DRIFT LEVEL: 930-Level

SECTION:

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Claude Baillargeon
PAR Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 133 DATE OF DRAINING: 30-04-04

UNIT DESCRIPTION: TDT 426 U/G Driven

	OK	N/A
Battery	✓	
Cooler liquid		
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: JULY 1ST, 04

DISPOSAL LOCATION: SEND TO NORTH PORTAL FOR U/G DISPOSAL

BENCH LEVEL:

U/G DRIFT LEVEL: 930-Level

SECTION:

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Claude Baillargeon
PER Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 152 DATE OF DRAINING: June 25/04

UNIT DESCRIPTION: ATLAS COPCO JUMBO

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

BATTERY - FIRE EXTINGUISHER + fire suppression

DATE OF PLACEMENT: JUNE 25/04

DISPOSAL LOCATION: AB/SCRAM

BENCH LEVEL: 885

U/G DRIFT LEVEL: 885

SECTION: LOWER

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Claude Bourbonnais
FOR Jean Halle
General Foreman

Gaston Lagacé
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: Anfo-Plant DATE OF DRAINING: June 30/04
UNIT DESCRIPTION: _____

	OK	N/A
Battery		✓
Cooler liquid		
Differentiel housing oil		
Extinguisher	✓	
Fuel tank	✓	
Glycol		
Hydraulic hose oil	✓	
Hydraulic brake oil		
Hydraulic clutch oil		
Hydraulic control oil	✓	
Hydraulic cylinder oil		
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		
Power steering oil		
Transfer case oil		✓
Transmission oil		
Windshield washer		

List the parts removed from unit:
Both hoppers Removed & buried.

DATE OF PLACEMENT: June 30/04
DISPOSAL LOCATION: AB-SCRAM
BENCH LEVEL: 885
U/G DRIFT LEVEL: 885
SECTION: Lower

Scanned June 22/05 L.V.D.

Claude Baillargeon
for Jean Halle
General Foreman

Yan Lapointe
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 316 DATE OF DRAINING: June 27/04

UNIT DESCRIPTION: ANFO TRUCK

	OK	N/A
Battery	✓	
Cooler liquid	✗	✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil		✓
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

Battery - FIRE EXTINGUISHER

DATE OF PLACEMENT: June 27/04
DISPOSAL LOCATION: ANFO PLANT Load-OUT
BENCH LEVEL: 900-RAMP
U/G DRIFT LEVEL: 950
SECTION:

Claude Bellavance
FOR Jean Halle
General Foreman

Jean Lagacé
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 741 DATE OF DRAINING: June 5, 04

UNIT DESCRIPTION: Toyota truck

	OK	N/A
Battery	x	
Cooler liquid	x	
Differentiel housing oil	x	
Extinguisher	x	
Fuel tank	x	
Glycol		x
Hydraulic hose oil		x
Hydraulic brake oil		x
Hydraulic clutch oil		x
Hydraulic control oil		x
Hydraulic cylinder oil		x
Hydraulic oil (tank)		x
Motor oil	x	
Planetary gear drive oil		x
Power steering oil	x	
Transfer case oil	x	
Transmission oil	x	
Windshield washer	x	

List the parts removed from unit:

DATE OF PLACEMENT: June 5, 04
DISPOSAL LOCATION: Beach (salvage)
BENCH LEVEL:
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Frédéric St-Hilaire
Mechanic

THE FOLLOWING IS A SUMMARY OF THE HYDRO CARLSON UTILITY WAS DRAINED FROM THE VARIOUS SYSTEMS PRIOR TO DEMOLISHING THE CAT & BENTHORN BUILDINGS.

	CAT #5	CAT #6
COOLANT SYSTEM 60/40 GLYCOL/WATER	= 2x205LT	3x205LT
- LUBRICATING OIL FROM ENGINE & LINES	= 4x205LT	2x205LT
- DRAINED ALL FUEL LINES ON ENGINES AND BUILDING	=	1x205LT
- GLYCOL HEATERS AND PIPING (MIXTURE 50/50)	= 1x205LT	

BENTHORN BUILDING 8000 GALLON FUEL TANK, REDUCED LEVEL TO 16" PRIOR TO SHUTTING DOWN CATS #5 & #6. WE THAN PUMPED REMAINING FUEL TO FUEL TRUCK UNTIL TRANSFER PUMP LOST SUCTION. WE THAN PIGGED 8" FUEL TRANSFER LINE FROM SHORE TANKS TO B/H BUILDING. ALL FUEL & SLUDGE REMAINING IN TRANSFER LINE WAS PUSHED BY PIG TO B/H TANK. AFTER RETRIEVING THE PIG THE FUEL TANK CONTENTS WAS PUMPED TO 4x205 LT DRUMS. WHEN THE TRANSFER PUMP LOST SUCTION WE REMOVED THE MANHOLE ON THE SIDE OF TANK AND THE REMAINING SLUDGE (APPROXIMATELY 1½") WAS VACUUMED UP WITH THE VACUUM TRUCK. ALL FUEL LINES IN B/H BUILDING WERE DISASSEMBLED & DRAINED TO 205LT DRUMS APPROXIMATELY 2x205 LT DRUMS.

ALL FUEL, OIL & GLYCOL THAT WAS COLLECTED TO DRUMS WERE TAKEN TO INCINERATOR FOR PROPER DISPOSAL.

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 108 DATE OF DRAINING: 28 06-04

UNIT DESCRIPTION: _____

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

CUTTED

DATE OF PLACEMENT: 9

DISPOSAL LOCATION: SEND TO NORTH PORTAL FOR U/G DISPOSAL

BENCH LEVEL:

U/G DRIFT LEVEL: 930-Level C

SECTION:

Claude Bilodeau
For Jean Halle
General Foreman

SYLVAIN VALLIERES
Mechanic

DANIEL Ouellette
draining specialist

STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record — MINE COOLING BUILDING

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
July 29/04	MINE COOLING	COMPRESSOR #1	OIL	15 gal approx	INCINERATOR			
July 29/04	MINE COOLING	COMPRESSOR #2	OIL	15 gal approx	INCINERATOR			
July 29/04	MINE COOLING	COMPRESSOR #3	OIL	15 gal approx	INCINERATOR			
July 29/04	MINE COOLING	COMPRESSOR #4	OIL	15 gal approx	INCINERATOR			

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 131 DATE OF DRAINING: 08-08-04

UNIT DESCRIPTION: MINE truck

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST 15.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: BENCH 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

(Kent Robert)
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 112 DATE OF DRAINING: 09-08-04

UNIT DESCRIPTION: Mine scoop

	OK	N/A	
Battery	✓		
Cooler liquid		✓	
Differentiel housing oil	✓		
Extinguisher		✓	NONE
Fuel tank	✓		
Glycol		✓	
Hydraulic hose oil	✓		
Hydraulic brake oil	✓		
Hydraulic clutch oil	✓		
Hydraulic control oil	✓		
Hydraulic cylinder oil	✓		
Hydraulic oil (tank)	✓		
Motor oil	✓		
Planetary gear drive oil	✓		
Power steering oil		✓	
Transfer case oil	✓		
Transmission oil	✓		
Windshield washer		✓	

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST 15.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: BENCH. 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

(BENT Robert)
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 110 DATE OF DRAINING: 08/08.04.

UNIT DESCRIPTION: Mine Scoop

	OK	N/A
Battery	✓	
Cooler liquid		
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	✓
Transfer case oil		✓
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:
UNIT DRAIN BY KENT ROBERT AND JEAN GUY HALLE.

DATE OF PLACEMENT: AUGUST 15. 04
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: BENCH 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Jean Guy Halle
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 153 DATE OF DRAINING: 08-07-04

UNIT DESCRIPTION: CAMION NASSEL FIRE

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: July 16. 04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench. 05. 04.
U/G DRIFT LEVEL:
SECTION:

Jean Hallé
General Foreman

Louis Sylvestre
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 315 DATE OF DRAINING: 04-07-04

UNIT DESCRIPTION: CAMION BOME

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: July/16-04

DISPOSAL LOCATION: C.R.D.

BENCH LEVEL: Bench 05.

U/G DRIFT LEVEL:

SECTION:

Jean Hallé
General Foreman

Louis St Hilaire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 181 DATE OF DRAINING: 06-07-04

UNIT DESCRIPTION: COMPRESSEUR

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil		/
Hydraulic clutch oil		/
Hydraulic control oil		/
Hydraulic cylinder oil		/
Hydraulic oil (tank)		/
Motor oil	/	
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil		/
Transmission oil		/
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: 15/07.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 250 DATE OF DRAINING: 6-04-04

UNIT DESCRIPTION: CANION

	OK	N/A
Battery		
Cooler liquid		
Differentiel housing oil	X	
Extinguisher		
Fuel tank		
Glycol		
Hydraulic hose oil		
Hydraulic brake oil		
Hydraulic clutch oil		
Hydraulic control oil		
Hydraulic cylinder oil		
Hydraulic oil (tank)		
Motor oil		
Planetary gear drive oil		
Power steering oil		
Transfer case oil		
Transmission oil	X	
Windshield washer		

List the parts removed from unit:

DATE OF PLACEMENT: 15/07. 04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: DRILL ORANGE 163 SOLO drill. DATE OF DRAINING: 05-07-04

UNIT DESCRIPTION: _____

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:
THE DRAINAGE AS BEEN FINISH. O/G BY. MECHANICS.

DATE OF PLACEMENT: AUGUST.
DISPOSAL LOCATION: MINE
BENCH LEVEL: _____
U/G DRIFT LEVEL: NORTH PORTAL DRIFT.
SECTION: _____

Jean Halle
General Foreman

Louis [illegible]
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 366 DATE OF DRAINING: AUGUST 08. 04.

UNIT DESCRIPTION: HARMER

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST 15. 04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: BENCH. 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 258 DATE OF DRAINING: 06-07-07

UNIT DESCRIPTION: CAMION

	OK	N/A
Battery		/
Cooler liquid		
Differentiel housing oil	X	
Extinguisher		
Fuel tank		
Glycol		
Hydraulic hose oil		
Hydraulic brake oil		
Hydraulic clutch oil		
Hydraulic control oil		
Hydraulic cylinder oil		
Hydraulic oil (tank)		
Motor oil		
Planetary gear drive oil		
Power steering oil		
Transfer case oil		
Transmission oil		
Windshield washer		

List the parts removed from unit:

DATE OF PLACEMENT: July 21. 04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench. 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 8C DATE OF DRAINING: 7-07-04

UNIT DESCRIPTION: CAMION ELEVATEUR

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil	X	
Extinguisher	X	
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	
Hydraulic brake oil	X	
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil	X	
Power steering oil	X	X
Transfer case oil	X	
Transmission oil	X	
Windshield washer		X

List the parts removed from unit:

DATE OF PLACEMENT: July.
DISPOSAL LOCATION: mine
BENCH LEVEL:
U/G DRIFT LEVEL: mine Ramp.
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 334 DATE OF DRAINING: 11-07-04

UNIT DESCRIPTION: NASSEL EXPLOSIF

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: July

DISPOSAL LOCATION: MINE

BENCH LEVEL:

U/G DRIFT LEVEL: MAIN DRIFT.

SECTION:

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 335 DATE OF DRAINING: 9-07-04

UNIT DESCRIPTION: NASSEL EXPLOSIF

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil	/	
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST

DISPOSAL LOCATION: MINE

BENCH LEVEL:

U/G DRIFT LEVEL: MAIN DRIFT

SECTION:

Jean Hallé
General Foreman

Louis St HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 255 DATE OF DRAINING: 19-07-04

UNIT DESCRIPTION: CAMION FORD

	OK	N/A
Battery	/	
Cooler liquid	/	
Differentiel housing oil	/	
Extinguisher		/
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil		/
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil		/
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil		/
Power steering oil	/	
Transfer case oil		/
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: July 19.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 05.
U/G DRIFT LEVEL:
SECTION:

Jean Hallé
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 159 DATE OF DRAINING: 15-04-04

UNIT DESCRIPTION: DRILL

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher	X	
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	
Hydraulic brake oil	X	
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil		X
Power steering oil	X	
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST
DISPOSAL LOCATION: MINE.
BENCH LEVEL: MAIN ROUTAL.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

LUCIEN HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 964 DATE OF DRAINING: 15-07-04

UNIT DESCRIPTION: SCOOPTRAM

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher		X
Fuel tank	X	
Glycol		X
Hydraulic hose oil		X
Hydraulic brake oil		X
Hydraulic clutch oil		X
Hydraulic control oil		X
Hydraulic cylinder oil		X
Hydraulic oil (tank)		X
Motor oil	X	
Planetary gear drive oil		X
Power steering oil		X
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

DATE OF PLACEMENT: July 24.04
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 05.
U/G DRIFT LEVEL:
SECTION:

Jean Hallé
General Foreman

Louis St-Hilaire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 963 DATE OF DRAINING: 21-07-04

UNIT DESCRIPTION: SOUDEUSE

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: July/24.04.
DISPOSAL LOCATION: L.T.P.
BENCH LEVEL: Bench. 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Louis St Hilaire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 111 DATE OF DRAINING: 24.07.04

UNIT DESCRIPTION: SCOOP

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST 15.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: BENCH 05.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 364 DATE OF DRAINING: 30-07-04

UNIT DESCRIPTION: TRAMACK

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil	/	
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST

DISPOSAL LOCATION: MINE

BENCH LEVEL:

U/G DRIFT LEVEL: MAIN DRIFT.

SECTION:

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 230 DATE OF DRAINING: 1-08-04

UNIT DESCRIPTION: CAT V200B FORKLIFT

	OK	N/A
Battery	/	
Cooler liquid	/	
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		N
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil	/	
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: AUGUST

DISPOSAL LOCATION: MINE

BENCH LEVEL:

U/G DRIFT LEVEL: MAIN DRIFT.

SECTION:

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: 3-08-04

UNIT DESCRIPTION: DIAMON DRILL

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher		X
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	X
Hydraulic brake oil		X
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil		X
Power steering oil		X
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: AUGUST / 05.04

DISPOSAL LOCATION: L.12.D

BENCH LEVEL: BENCH 5

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 111 DATE OF DRAINING: 2-08-04

UNIT DESCRIPTION: SCOOP

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT:

DISPOSAL LOCATION: MINE

BENCH LEVEL:

U/G DRIFT LEVEL: MAIN DRIFT. (MAIN PORTAL)

SECTION:

Jean Halle
General Foreman

LOUIS SYLVAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: D-53 DATE OF DRAINING: 20-08-04

UNIT DESCRIPTION: Ford truck

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil		✓
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

Cossinco Keep The Truck For Further use.

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 198 DATE OF DRAINING: 20-08-04

UNIT DESCRIPTION: Compressor

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: 28/08/04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL:
U/G DRIFT LEVEL:
SECTION:

Jean Hallie
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 387 DATE OF DRAINING: 18-08-04

UNIT DESCRIPTION: Height lift

	OK	N/A
Battery	✓	
Cooler liquid	✓	✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: 28/08/04.
DISPOSAL LOCATION: I.R.P.
BENCH LEVEL: 5.
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: August 1/20.04.

UNIT DESCRIPTION: Service tank from the (Tank farm)

	OK	N/A
Battery		✓
Cooler liquid		✓
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil		✓
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: August 31.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 5
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: 2 UNIT ON AUGUST / 25.04.

2 unit on July = 16/04.

UNIT DESCRIPTION: Reefer from the Kitchen (4 unit)

	OK	N/A	
Battery	✓		
Cooler liquid		✓	
Differentiel housing oil		✓	
Extinguisher	✓		
Fuel tank	✓		→ 180 Gallon.
Glycol		✓	
Hydraulic hose oil		✓	
Hydraulic brake oil		✓	
Hydraulic clutch oil		✓	
Hydraulic control oil		✓	
Hydraulic cylinder oil		✓	
Hydraulic oil (tank)		✓	
Motor oil		✓	
Planetary gear drive oil		✓	
Power steering oil		✓	
Transfer case oil		✓	
Transmission oil		✓	
Windshield washer		✓	

List the parts removed from unit:

Some of the unit has been drain (2) at the L.R.D. By Tower Arctic, on August /13.04.
The one we have at Temporary camps has been drain By Yukon Quigley on August /25.04.
All the Reefer as been clean By John Singleton.

DATE OF PLACEMENT: 2 UNIT: August 14/04 - 2 UNIT on August 25.04
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 5.
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: August 13 and 14 /04.

UNIT DESCRIPTION: Transformer frustration lake road

	OK	N/A
Battery		✓
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher		✓
Fuel tank		✓
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil		✓
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: August 15. 04.
DISPOSAL LOCATION: Bench 5 L.R.D.
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: South-west.

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 387 DATE OF DRAINING: 18-08-04

UNIT DESCRIPTION: Height Lift

	OK	N/A
Battery	✓	
Cooler liquid	✓	✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: 28/08/04.
DISPOSAL LOCATION: I.R.D.
BENCH LEVEL:
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 198 DATE OF DRAINING: 20-08-04

UNIT DESCRIPTION: Compressor

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: 28/08/04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL:
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: Q53 DATE OF DRAINING: 20-08-04

UNIT DESCRIPTION: Ford truck

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil		✓
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

Cossinco Keep The Truck For Further use.

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 111 DATE OF DRAINING: 2-08-04

UNIT DESCRIPTION: SCOOP

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

LOUIS SYLVAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: 3-08-08

UNIT DESCRIPTION: DIAMON DRILL

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher		X
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	X
Hydraulic brake oil		X
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil		X
Power steering oil		X
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

_____
Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 230 DATE OF DRAINING: 1-08-04

UNIT DESCRIPTION: CAT V200B FORKLIFT

	OK	N/A
Battery	/	
Cooler liquid	/	
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		N
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil	/	
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 364 DATE OF DRAINING: 30-07-04

UNIT DESCRIPTION: TRAMACK

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: August 1/20.04.

UNIT DESCRIPTION: Service tank from the (Tank farm)

	OK	N/A
Battery		✓
Cooler liquid		✓
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil		✓
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: August 31.04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 5
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: 2 UNIT ON AUGUST / 25.04.

2 unit on July = 16/04.

UNIT DESCRIPTION: Reefer from the Kitchen (4 unit)

	OK	N/A	
Battery	✓		
Cooler liquid		✓	
Differentiel housing oil		✓	
Extinguisher	✓		
Fuel tank	✓		→ 180 Gallon.
Glycol		✓	
Hydraulic hose oil		✓	
Hydraulic brake oil		✓	
Hydraulic clutch oil		✓	
Hydraulic control oil		✓	
Hydraulic cylinder oil		✓	
Hydraulic oil (tank)		✓	
Motor oil		✓	
Planetary gear drive oil		✓	
Power steering oil		✓	
Transfer case oil		✓	
Transmission oil		✓	
Windshield washer		✓	

List the parts removed from unit:

Some of the unit has been drain (2) at the L.R.D. By Tower Arctic, on August /13.04.
The one we have at Temporary camps has been drain By Yukon Quigley on August /25.04.
All the Reefer as been clean By John Singleton.

DATE OF PLACEMENT: 2 UNIT: August 14/04 - 2 UNIT on August 25.04
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: Bench 5.
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: August 13 and 14 /04.

UNIT DESCRIPTION: Transformer frustration lake road

	OK	N/A
Battery		✓
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher		✓
Fuel tank		✓
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil		✓
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: August 15. 04.
DISPOSAL LOCATION: Bench 5 L.R.D.
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: South-west.

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 387 DATE OF DRAINING: 18-08-04

UNIT DESCRIPTION: Height Lift

	OK	N/A
Battery	✓	
Cooler liquid	✓	✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: 28/08/04.
DISPOSAL LOCATION: I.R.D.
BENCH LEVEL:
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 198 DATE OF DRAINING: 20-08-04

UNIT DESCRIPTION: Compressor

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: 28/08/04.
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL:
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: Q53 DATE OF DRAINING: 20-08-04

UNIT DESCRIPTION: Ford truck

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil		✓
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

Cossinco Keep The Truck For Further use.

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 111 DATE OF DRAINING: 2-08-04

UNIT DESCRIPTION: SCOOP

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

LOUIS SYLVAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: 3-08-08

UNIT DESCRIPTION: DIAMON DRILL

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher		X
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	X
Hydraulic brake oil		X
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil		X
Power steering oil		X
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

_____
Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 230 DATE OF DRAINING: 1-08-04

UNIT DESCRIPTION: CAT V200B FORKLIFT

	OK	N/A
Battery	/	
Cooler liquid	/	
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		N
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil	/	
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 364 DATE OF DRAINING: 30-07-04

UNIT DESCRIPTION: TRAMACK

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 111 DATE OF DRAINING: 24.07.04

UNIT DESCRIPTION: SCOOP

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 963 DATE OF DRAINING: 21-04-04

UNIT DESCRIPTION: SOUDEUSE

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 464 DATE OF DRAINING: 15-07-04

UNIT DESCRIPTION: SOUDEUSE

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher		X
Fuel tank	X	
Glycol		X
Hydraulic hose oil		X
Hydraulic brake oil		X
Hydraulic clutch oil		X
Hydraulic control oil		X
Hydraulic cylinder oil		X
Hydraulic oil (tank)		X
Motor oil	X	
Planetary gear drive oil		X
Power steering oil		X
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Hallé
General Foreman

Louis St-Hilaire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 159 DATE OF DRAINING: 15-04-04

UNIT DESCRIPTION: DRILL

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil		X
Extinguisher	X	
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	
Hydraulic brake oil	X	
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil		X
Power steering oil	X	
Transfer case oil		X
Transmission oil		X
Windshield washer		X

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Luis St HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 255 DATE OF DRAINING: 19-07-04

UNIT DESCRIPTION: CAMION FORD

	OK	N/A
Battery	/	
Cooler liquid	/	
Differentiel housing oil	/	
Extinguisher		/
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil		/
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil		/
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil		/
Power steering oil	/	
Transfer case oil		/
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Hallé
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 335 DATE OF DRAINING: 9-07-04

UNIT DESCRIPTION: NASSEL EXPLOSIF

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil	/	
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Louis St Hilaire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 334 DATE OF DRAINING: 11-07-04

UNIT DESCRIPTION: NASSEL EXPLOSIF

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

Louis St Hilaire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 30 DATE OF DRAINING: 7-07-04

UNIT DESCRIPTION: CAMION ÉLÉVATEUR

	OK	N/A
Battery	X	
Cooler liquid		X
Differentiel housing oil	X	
Extinguisher	X	
Fuel tank	X	
Glycol		X
Hydraulic hose oil	X	
Hydraulic brake oil	X	
Hydraulic clutch oil		X
Hydraulic control oil	X	
Hydraulic cylinder oil	X	
Hydraulic oil (tank)	X	
Motor oil	X	
Planetary gear drive oil	X	
Power steering oil	X	X
Transfer case oil	X	
Transmission oil	X	
Windshield washer		X

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Hallé
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 258 DATE OF DRAINING: 06-07-04

UNIT DESCRIPTION: CAMION

	OK	N/A
Battery		/
Cooler liquid		/
Differentiel housing oil	X	
Extinguisher		/
Fuel tank		/
Glycol		/
Hydraulic hose oil		/
Hydraulic brake oil		/
Hydraulic clutch oil		/
Hydraulic control oil		/
Hydraulic cylinder oil		/
Hydraulic oil (tank)		/
Motor oil		/
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil		/
Transmission oil		/
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 366 DATE OF DRAINING: _____

UNIT DESCRIPTION: HARMER

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: DRILL ORANGE DATE OF DRAINING: 05-07-04

UNIT DESCRIPTION: _____

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

Louis [illegible]
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 236 DATE OF DRAINING: 6-04-04

UNIT DESCRIPTION: CANIOR Truck.

	OK	N/A
Battery		/
Cooler liquid		/
Differentiel housing oil	X	/
Extinguisher		/
Fuel tank		/
Glycol		/
Hydraulic hose oil		/
Hydraulic brake oil		/
Hydraulic clutch oil		/
Hydraulic control oil		/
Hydraulic cylinder oil		/
Hydraulic oil (tank)		/
Motor oil		/
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil		/
Transmission oil	X	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 181 DATE OF DRAINING: 06-07-04

UNIT DESCRIPTION: COMPRESSEUR

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol		/
Hydraulic hose oil	/	
Hydraulic brake oil		/
Hydraulic clutch oil		/
Hydraulic control oil		/
Hydraulic cylinder oil		/
Hydraulic oil (tank)		/
Motor oil	/	
Planetary gear drive oil		/
Power steering oil		/
Transfer case oil		/
Transmission oil		/
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 315 DATE OF DRAINING: 08-07-04

UNIT DESCRIPTION: CAMION BOME
Boom Truck

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

LOUIS ST HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 153 DATE OF DRAINING: 08-07-04

UNIT DESCRIPTION: CAMION NASSEL FIXE
Fixed Axle Truck.

	OK	N/A
Battery	/	
Cooler liquid		/
Differentiel housing oil	/	
Extinguisher	/	
Fuel tank	/	
Glycol	/	
Hydraulic hose oil	/	
Hydraulic brake oil	/	
Hydraulic clutch oil		/
Hydraulic control oil	/	
Hydraulic cylinder oil	/	
Hydraulic oil (tank)	/	
Motor oil	/	
Planetary gear drive oil	/	
Power steering oil		/
Transfer case oil	/	
Transmission oil	/	
Windshield washer		/

List the parts removed from unit:

DATE OF PLACEMENT: _____
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Louis Sylvain Mire
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 110 DATE OF DRAINING: _____

UNIT DESCRIPTION: Mine Scoop

	OK	N/A
Battery	✓	
Cooler liquid		
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil		✓
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor ~~oil~~	✓	
Planetary gear drive oil	✓	
Power steering oil	✓	✓
Transfer case oil		✓
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

_____ Jean Ay-b Coulo

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 112 DATE OF DRAINING: 09-08-04

UNIT DESCRIPTION: Mine scoop

	OK	N/A	
Battery	✓		
Cooler liquid		✓	
Differentiel housing oil	✓		
Extinguisher		✓	NONE
Fuel tank	✓		
Glycol		✓	
Hydraulic hose oil	✓		
Hydraulic brake oil	✓		
Hydraulic clutch oil	✓		
Hydraulic control oil	✓		
Hydraulic cylinder oil	✓		
Hydraulic oil (tank)	✓		
Motor oil	✓		
Planetary gear drive oil	✓		
Power steering oil		✓	
Transfer case oil	✓		
Transmission oil	✓		
Windshield washer		✓	

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 131 DATE OF DRAINING: 08-08-04

UNIT DESCRIPTION: MINE truck

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	✓	
Hydraulic cylinder oil	✓	
Hydraulic oil (tank)	✓	
Motor oil	✓	
Planetary gear drive oil	✓	
Power steering oil		✓
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: _____

DISPOSAL LOCATION: _____

BENCH LEVEL: _____

U/G DRIFT LEVEL: _____

SECTION: _____

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: August 20.04.

UNIT DESCRIPTION: Service tank from the (Tank farm)

	OK	N/A
Battery		✓
Cooler liquid		✓
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil		✓
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: August 21.04.
DISPOSAL LOCATION: C.R.D.
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Halle
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: août 13 août 14. /04.

UNIT DESCRIPTION: Transformer frustration lake road

	OK	N/A
Battery		✓
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher		✓
Fuel tank		✓
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil		✓
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

_____

_____

_____

_____

DATE OF PLACEMENT: SEE DISPOSAL LOGS.
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

_____ _____

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: _____ DATE OF DRAINING: _____

UNIT DESCRIPTION: Reefer from the Kitchen (4 unit)

	OK	N/A	
Battery	✓		
Cooler liquid		✓	
Differentiel housing oil		✓	
Extinguisher	✓		
Fuel tank	✓		→ 150 Gallon.
Glycol		✓	
Hydraulic hose oil		✓	
Hydraulic brake oil		✓	
Hydraulic clutch oil		✓	
Hydraulic control oil		✓	
Hydraulic cylinder oil		✓	
Hydraulic oil (tank)		✓	
Motor oil		✓	
Planetary gear drive oil		✓	
Power steering oil		✓	
Transfer case oil		✓	
Transmission oil		✓	
Windshield washer		✓	

List the parts removed from unit:

Some of the unit has been drain (2) at the L.Rid. By Tower drains, on August 13.04.
The one we have at Temporary camps has been drain By Yvan Duguay on August 25.04.
All the Reefer as been clean By John Singleton.

DATE OF PLACEMENT: See DISPOSAL Logs.
DISPOSAL LOCATION: _____
BENCH LEVEL: _____
U/G DRIFT LEVEL: _____
SECTION: _____

Jean Hallé
General Foreman

Jean Lavergne
Mechanic

Refrigerant Data Sheet

Date: 25/08/04

Type of Refrigerant: R-22

Amount of Refrigerant: 397 lbs

Location Recovered: mine cooling.

Technician: John F. Singleton, Tundra Site Services

Certificate Number: NF-2920

Contractor: SNC Lavalin Engineers and Constructors /Tundra Site Services

Refrigerant Data Sheet

Date: 25/08/04

Type of Refrigerant: R-22

Amount of Refrigerant: 643 16's

Location Recovered: Mine cooling.

Technician: John F. Singleton, Tundra Site Services

Certificate Number: NF-2920

Contractor: SNC Lavalin Engineers and Constructors /Tundra Site Services

Refrigerant Data Sheet

Date: Aug 31/04

Type of Refrigerant: R-22

Amount of Refrigerant: 241 kg

Location Recovered: Mink Cooling

Technician: John F. Singleton, Tundra Site Services

Certificate Number: NF-2920

Contractor: SNC Lavalin Engineers and Constructors /Tundra Site Services

Refrigerant Data Sheet

Date: 25/08/04

Type of Refrigerant: R-22

Amount of Refrigerant: 179 Kg

Location Recovered: mine cooling units & Accommodations units.

Technician: John F. Singleton, Tundra Site Services

Certificate Number: NF-2920

Contractor: SNC Lavalin Engineers and Constructors /Tundra Site Services

Refrigerant Data Sheet

Date: 25/08/04

Type of Refrigerant: R-22

Amount of Refrigerant: 313 16's

Location Recovered: mine Cooling.

Technician: John F. Singleton, Tundra Site Services

Certificate Number: NF-2920

Contractor: SNC Lavalin Engineers and Constructors /Tundra Site Services

Refrigerant Data Sheet

Date: 25/08/04

Type of Refrigerant: R-22

Amount of Refrigerant: 179 kg

Location Recovered: mine cooling.

Technician: John F. Singleton, Tundra Site Services

Certificate Number: NF-2920

Contractor: SNC Lavalin Engineers and Constructors /Tundra Site Services

STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	Main mine entrance	#2 mine cooling unit	Freon 22	400 lbs		Tundra		
		Serial # 5.651.721						
			Oil	10 gal.	incenterator.	Tundra.		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	Main mine entrance	#3 mine Cooling Unit	Freon 22	400 lbs		Tundra		
		Serial # 5.651.724						
			10 gal. oil	10 gal.	incenterator	Tundra		

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STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	MAIN MINE ENTRANCE	#1 MINE COOLING UNIT	FREON 22	300 LBS		TUNDRA		
		SERIAL # 5.651 · 723						
			10 GAL. OIL	10 GAL.	INCENTORATOR	TUNDRA.		

STATIONARY EQUIPMENT LUBRICANT EVACUATION CHECKLIST

Cominco Polaris Minesite Demolition and Reclamation Project
Daily Activity Log and Disposal Record

SNC-LAVALIN Engineers & Constructors

Date	Origin Location	Equipment Description	Lubricant/Fluid Type	Quantity If Appl.	Disposal Location	Sub-Contractor	SLEC	Owner/Rep
16/07/04	MAIN mine entrance	#4 mine cooling unit	Freon 22	340 lbs		Tundra.		
		serial # 5.651.722						
			10gal oil	10gal.	inventory tor	Tundra.		

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 659
UNIT DESCRIPTION: TOYOTA

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil		✓
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:
ENGINE, TRANSMISSION, FUEL TANK, BRAKE + CLUTCH MASTER CYL.
DISPOSED OF IN L.R.D.

Claude Bellavance
For: Jean Halle
General Foreman

P. Markham.
Mechanic

PNB

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 258 DATE OF DRAINING: 16-09-03

UNIT DESCRIPTION: TRUCK

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher		✓
Fuel tank	✓	
Glycol	✓	✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		
Hydraulic cylinder oil		
Hydraulic oil (tank)	✓	
Motor oil	✓	✓
Planetary gear drive oil		✓
Power steering oil		
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

UNIT STRIPPED OF ALL MOTOR, DRIVE RELATED PARTS AND DISPOSED OF

List the parts removed from unit:

UNITS STILL BEING SCAVENGED FOR PARTS — OCT 1.03

DATE OF PLACEMENT: MARCH 15, 04

DISPOSAL LOCATION: L.R.P.

BENCH LEVEL: BENCH 5

U/G DRIFT LEVEL:

SECTION:

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 250 DATE OF DRAINING: 16-17/09/03

UNIT DESCRIPTION: TRUCK

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil		
Extinguisher		
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		
Hydraulic brake oil		
Hydraulic clutch oil		
Hydraulic control oil		
Hydraulic cylinder oil		
Hydraulic oil (tank)	✓	
Motor oil		✓
Planetary gear drive oil		
Power steering oil		
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		

List the parts removed from unit:
UNIT STILL BEING SCAVENGED FOR PARTS — OCT 1, 03

DATE OF PLACEMENT: MARCH 15, 04
DISPOSAL LOCATION: L.R.D. * RELOCATED @ BALL FIELD
BENCH LEVEL: BENCH 5
U/G DRIFT LEVEL:
SECTION:

JUNE 03, 04

Jean Halle
General Foreman

Mechanic

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FNL

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 258 DATE OF DRAINING: 16-09-03

UNIT DESCRIPTION: TRUCK

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil	✓	
Extinguisher		✓
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		
Hydraulic cylinder oil		
Hydraulic oil (tank)	✓	
Motor oil	✓	✓
Planetary gear drive oil		✓
Power steering oil		
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer		✓

List the parts removed from unit:
UNITS STILL BEING SCAVENGED FOR PARTS — OCT 1.03

DATE OF PLACEMENT: MARCH 15, 04
DISPOSAL LOCATION: L.R.P. = * RELOCATED @ BALL FIELD
BENCH LEVEL: BENCH 5
U/G DRIFT LEVEL:
SECTION:

JUNE 03, 04

Jean Halle
General Foreman

Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 196 DATE OF DRAINING: APRIL 28, 04

UNIT DESCRIPTION: COMPRESSOR

	OK	N/A
Battery		✓
Cooler liquid	✓	
Differentiel housing oil		✓
Extinguisher	✓	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:
COMPRESSOR OIL (OK)

DATE OF PLACEMENT: APRIL 28, 04
DISPOSAL LOCATION: L.R.D.
BENCH LEVEL: 6
U/G DRIFT LEVEL:
SECTION:

Jean Halle / CLAUDE BAILLARGEON
General Foreman

FRÉDÉRIC ST-HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 964 DATE OF DRAINING: APRIL 28, 04

UNIT DESCRIPTION: WELDER MACHINE

	OK	N/A
Battery	✓	
Cooler liquid		✓
Differentiel housing oil		✓
Extinguisher		✓
Fuel tank	✓	
Glycol		✓
Hydraulic hose oil		✓
Hydraulic brake oil		✓
Hydraulic clutch oil		✓
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil		✓
Transfer case oil		✓
Transmission oil		✓
Windshield washer		✓

List the parts removed from unit:

DATE OF PLACEMENT: APRIL 29, 04
DISPOSAL LOCATION: L.R.O.
BENCH LEVEL: 6
U/G DRIFT LEVEL:
SECTION:

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André Baillargeon
Jean Halle
General Foreman

FRÉDÉRIC ST-HILAIRE
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: TOYOTA BRUN 653 DATE OF DRAINING: 01/05/2004
UNIT DESCRIPTION: TOYOTA MUCK

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil AV OK AR OK	✓	
Extinguisher	—	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil	—	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	—	
Hydraulic cylinder oil	—	
Hydraulic oil (tank)	—	
Motor oil	✓	
Planetary gear drive oil	—	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

DATE OF PLACEMENT: MAY 03, 2004
DISPOSAL LOCATION: LRd
BENCH LEVEL: 6
U/G DRIFT LEVEL:
SECTION:

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Jean Halle
General Foreman

JERRY
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 740 DATE OF DRAINING: 2/05/2004

UNIT DESCRIPTION: TOYOTA NOVA

	OK	N/A
Battery		
Cooler liquid	✓	
Differentiel housing oil DV	✓	
Extinguisher		✓
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil	✓	
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil	—	
Hydraulic cylinder oil	—	
Hydraulic oil (tank)	—	
Motor oil	✓	
Planetary gear drive oil	—	
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

DATE OF PLACEMENT: MAY 3rd, 2004
DISPOSAL LOCATION: LRd
BENCH LEVEL: 6
U/G DRIFT LEVEL:
SECTION:

Jean Halle
General Foreman

JERRY
Mechanic

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EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 059

UNIT DESCRIPTION: TOYOTA

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil		✓
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

ENGINE, TRANSMISSION, FUEL TANK, BANKET CLUTCH MASTER CYL.

Claude Bellavance

Ed: Jean Halle
General Foreman

P. Markham.

Mechanic

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EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 111 DATE OF DRAINING: June 3, 04

UNIT DESCRIPTION: Scoop

	OK	N/A
Battery	x	
Cooler liquid	x	
Differentiel housing oil	x	
Extinguisher	x	
Fuel tank	x	
Glycol		x
Hydraulic hose oil	x	
Hydraulic brake oil	x	
Hydraulic clutch oil		x
Hydraulic control oil	x	
Hydraulic cylinder oil	x	
Hydraulic oil (tank)	x	
Motor oil	x	
Planetary gear drive oil	x	
Power steering oil	x	
Transfer case oil	x	
Transmission oil	x	
Windshield washer		x

List the parts removed from unit:

DATE OF PLACEMENT: June 4, 04
DISPOSAL LOCATION: L-R-D
BENCH LEVEL: 6
U/G DRIFT LEVEL:
SECTION:

Jean Hallé
General Foreman

Frédéric St-Hilaire
Mechanic

MACHINE # 763 Toyota DATE: June 4, 2004 DRAINAGE OF MACHINES

MODEL # Toyota Landcruiser

	DRAINED	NONE	OUT
MOT OIL	✓		
ANTIFREEZ	✓		
HYD OIL	Steering	✓	
DIFF OIL	✓		
BRAKE OIL	✓		
BATTREY	Removed		✓
HOSES	✓		
FUEL TANK	✓		
NITROGEN		✓	
TRANNY	✓	✓	
TRANSFERCASE	✓		
Remove clutch	✓		

REMARKS MECH: Mechanic Paul Loosie

Removed front driveshaft, Radiator, steering reservoir, master brake cylinder, clutch reservoir, alternator, front grill, Heater Blower Housing, Alternator bracket

DRAINED Transmission and Transfer Case

7

Scanned June 23/04

MACHINE # 746 DATE: June 7, 2004 DRAINAGE OF MACHINES

MODEL #

	DRAINED	NONE	OUT
MOT OIL	✓		✓
ANTIFREEZ	✓		✓
HYD OIL	✓		✓
DIFF OIL	✓		✓
BRAKE OIL	✓		✓
BATTREY	✓		✓
HOSES	✓		✓
FUEL TANK	✓		✓
NITROGEN	✓		✓
TRANNY	✓		✓
TRANSFER CASE	✓		

REMARKS

MECH: Paul (Siakuluk) Okadlak

-Remove : Engine with transmission
: Brake master cylinder
: clutch master cylinders
: Radiator and reservoir
: steering pump and reservoir
:

Scanned June 23/04

DRAINAGE REPORT

TWO (2) DEUTZ 12 CYLINDER ENGINES.

BOTH THESE UNITS HAVE BEEN DRAIN OF ENGINE OILS.

DATE OF PLACEMENT: JUNE 16. 2004

DISPOSAL LOCATION: LRD

SNC SUPERVISOR

DRAINAGE REPORT

THREE TOYOTA ENGINE BLOCKS.

ALL THREE UNITS HAVE BEEN DRAIN OF ENGINE OILS.

DATE OF PLACEMENT: June 16, 2004

DISPOSAL LOCATION: LRD

SNC SUPERVISOR

Paul S

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 752
UNIT DESCRIPTION: TOYOTA.

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil		✓
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:
FUEL TANK REMOVED FROM VEHICLE, ALSO ENGINE, TRANS, CLUTCH & BRAKE MASTER CYL'S, POWER STEERING RES., & DIFFERENTIALS, FRONT AXLE HOUSING.
DISPOSED OF IN LRD

Brian Lowes
Jean Halle
General Foreman

P. Markham.
Mechanic

Scanned June 23/04

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 752
UNIT DESCRIPTION: TOYOTA

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
Fuel tank	✓	
Glycol	✓	
Hydraulic hose oil		✓
Hydraulic brake oil	✓	
Hydraulic clutch oil	✓	
Hydraulic control oil		✓
Hydraulic cylinder oil		✓
Hydraulic oil (tank)		✓
Motor oil	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:
FUEL TANK REMOVED FROM VEHICLE, ALSO ENGINE, TRANS, CLUTCH & BRAKE MASTER CYL'S, POWER STEERING RES., & DIFFERENTIALS, FRONT AXLE HOUSING.

Brian Powers
Jean Halle
General Foreman

P. Markham
Mechanic

EQUIPEMENTS INDUSTRIELS ROBERT LTEE
POLARIS MINE

DRAINING REPORT

The goal of this procedure is to remove most of the oil and other liquid from the unit before it goes to scrap to reduce fire and explosion hazard and eliminate environmental contamination.

UNIT #: 752
UNIT DESCRIPTION: TOYOTA

	OK	N/A
Battery	✓	
Cooler liquid	✓	
Differentiel housing oil	✓	
Extinguisher	✓	
	✓	
	✓	
		✓
lic brake oil	✓	
lic clutch oil	✓	
lic control oil		✓
lic cylinder oil		✓
		✓
	✓	
Planetary gear drive oil		✓
Power steering oil	✓	
Transfer case oil	✓	
Transmission oil	✓	
Windshield washer	✓	

List the parts removed from unit:

FUEL TANK REMOVED FROM VEHICLE, ALSO ENGINE, TRANS, CLUTCH & BRAKE MASTER CYL'S, POWER STEERING RES., & DIFFERENTIALS, FRONT AXLE HOUSING.

Brian Powers
Jean Halle
General Foreman

P. Markham
Mechanic

POLARIS MINE – 2004 1ST QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

March 4, 2004

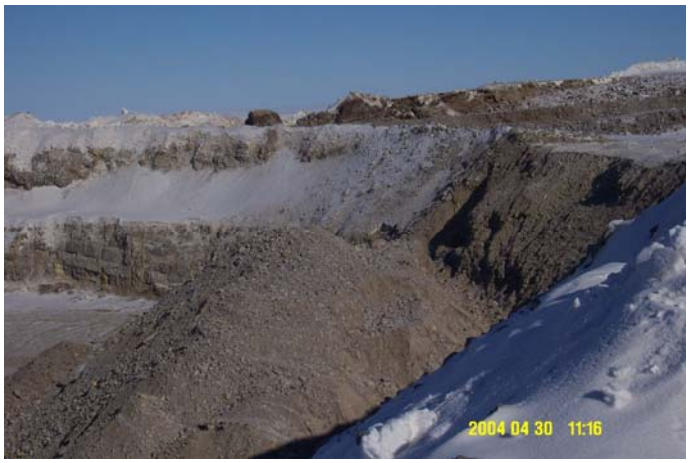
March 29, 2004

March 29, 2004

POLARIS MINE – 2004 2ND QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

April 18, 2004

April 18, 2004



April 30, 2004

POLARIS MINE – 2004 2ND QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

April 30, 2004

April 30, 2004

May 5, 2004

POLARIS MINE – 2004 2ND QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

May 17, 2004

May 31, 2004

June 12, 2004

POLARIS MINE – 2004 2ND QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

June 12, 2004

June 12, 2004

June 24, 2004

POLARIS MINE – 2004 3rd QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

July 2, 2004

July 2, 2004

July 11, 2004

POLARIS MINE – 2004 3rd QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

July 30, 2004

July 30, 2004

August 7, 2004

POLARIS MINE – 2004 3rd QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

August 20, 2004

August 30, 2004

August 30, 2004

POLARIS MINE – 2004 3rd QUARTER DEBRIS PLACED INTO LRD QUARRY LANDFILL

September 7, 2004

September 7, 2004

September 7, 2004

APPENDIX 11

RECORD of CONTAMINATED SOILS EXCAVATED

AND

DISPOSAL LOCATIONS IN THE MINE

TABLE 1
POLARIS MINE - CONTAMINATED SOILS EXCAVATED
TO DECEMBER 31, 2004

[1]Contaminated Soil Locations	DRP Forecast Volumes To Be Excavated (m^3 in-situ volume)		[4]Estimated Volumes Excavated To Date (m^3 in-situ volume)		Estimated Volumes Excavated During 2004 (m^3 in-situ volume)		[3]Total Volumes Excavated (m^3 in-situ volume)	
	Hydrocarbons	Metals	Hydrocarbons	Metals	Hydrocarbons	Metals	Hydrocarbons	Metals
North Portal Pb Ore Stockpile Area	-	TBA	-	11,352	-	-	-	11,352
Fuel Bladder Storage Area	12,000	-	12,513	-	-	-	12,513	-
Old Crusher	-	TBA	-	1,079	-	-	-	1,079
Tails Thickener/ Tailings Lines	TBA	3,000	-	2,183	-	-	-	2,183
CRF Plant	100	-	40	-	-	-	40	-
Exploration Dump & Stockpile Area		TBA	-	11,028	-	10,607	-	21,635
Firehall Training Area	2,000		1,465	-	11,747	5,048	13,212	5,048
Concentrate Storage Shed Area	Note 2	Note 2	-	24,314	1,731	26,869	1,731	51,183
Barge Area	20,000	85,000	28,314	-	48,164	31,985	76,478	31,985
Dock Cells			12,210		3,519	8,481	15,729	8,481
Shoreline				44,645	-	(9,666)	-	34,979
Foldaway Buildings	2,000	-	628	110	15,946	161	16,574	271
Incinerator Area							4,390	6,110
Accommodation Building	500	-	-	-	1,800	-	1,800	-
Quonset Huts	TBA	-	-	-	-	-	-	-
Snow Dumps		3,500		1,641	-	14,000	-	15,641
Lube Storage / Tank Farm Area	-	-			3,150	-	3,150	-
June 2002 Fuel Spill	Note 3	-	-	-	580	-	580	-
Miscellaneous	-		-	-	628	110	628	110
TOTALS	36,600	91,500	55,170	96,352	87,265	87,595	146,825	190,057
TOTAL CONTAMINANTS		**128,100**		**151,522**		**174,860**		**336,882**

Notes:

Note 1 - Some area boundaries have changed from the 2003 4th Quarter report as volumes presented are based on surveyed data which has changed the definition of some of the areas.

Note 2 - DRP estimated metals contaminated soils in the Concentrate Storage Area and the Barge area together as one quantity.

Note 3 - this fuel spill ocurred after the DRP was issued so there was not estimate for it.

Note 4 - Total volumes are based on surveys of remediated areas.

Abreviations:

DRP - Decommissioning and Reclamation Plan

TBA - Areas identified in the DRP as being contaminated but no estimate of volumes were made as investigations were not completed.

TABLE 2
POLARIS MINE - CONTAMINATED SOILS HANDLING TO DECEMBER 31, 2004

HYDROCARBON CONTAMINATED SOILS		METALS CONTAMIANTED SOILS		TOTALS CONTAMINATED SOILS (M^3)		
LRDQL	MINE	LRDQL	MINE	LRDQL	MINE	TOTAL
0	146,844	80,324	109,774	80,324	256,618	336,942

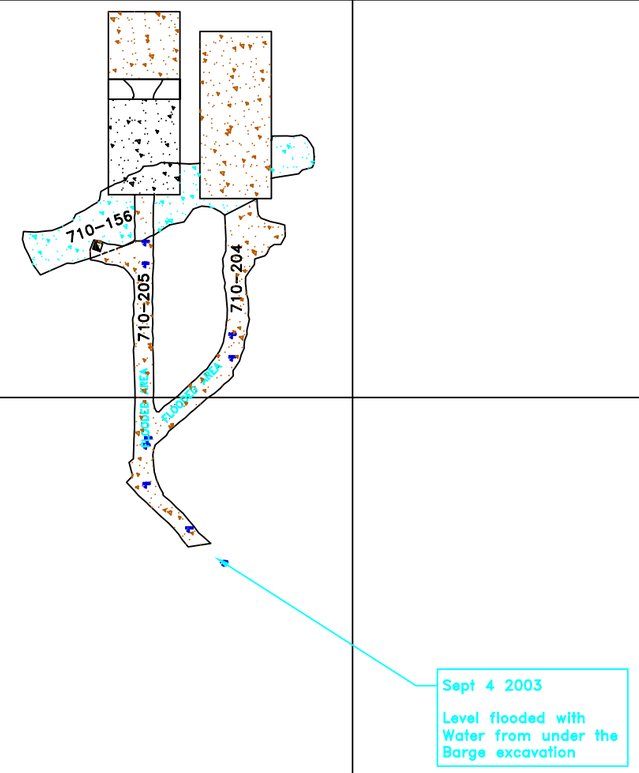
NOTES:

Hydrocarbon Soils include Co-contaminated (Metals & Hydrocarbons)
LRDQL - refers to Little Red Dog Quarry Landfill
MINE - refers to the underground working of the mine

2200 N | 2100 N | 2000 N | 1900 N | 1800 N

1600 E | 1600 E

1500 E | 1500 E



1400 E | 1400 E

2200 N | 2100 N | 2000 N | 1900 N | 1800 N

MATERIALS PLACED UNDERGROUND

NORMAL MINE BACKFILL FROM OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER MATERIALS STORAGE

POLARIS MINE

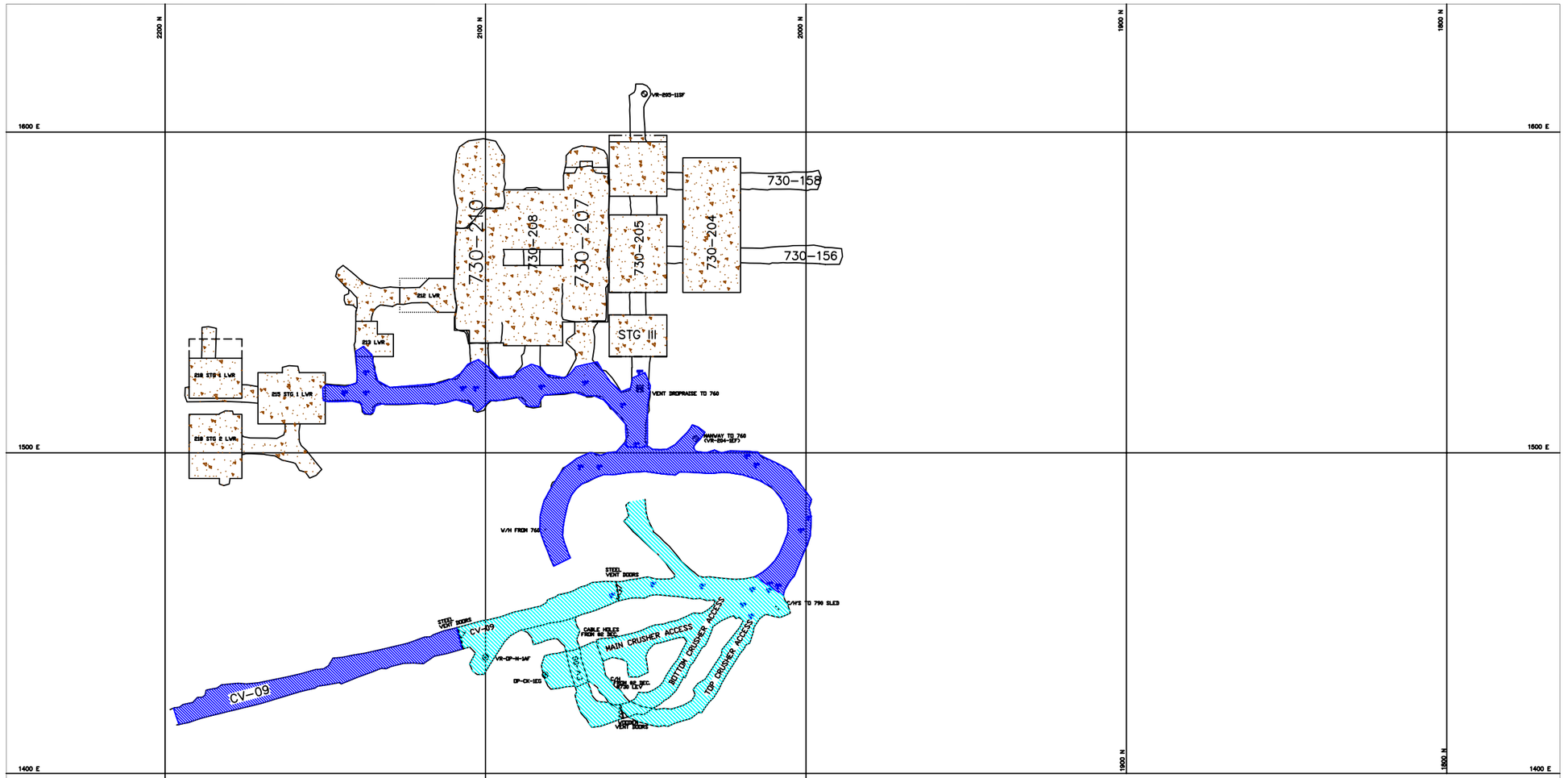
DRAWN BY: J.A.	CHECKED BY:	
REVISED BY:	DATE:	REVISION

710 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED

as of December 31, 2004

SCALE: 1:1500



MATERIALS PLACED UNDERGROUND

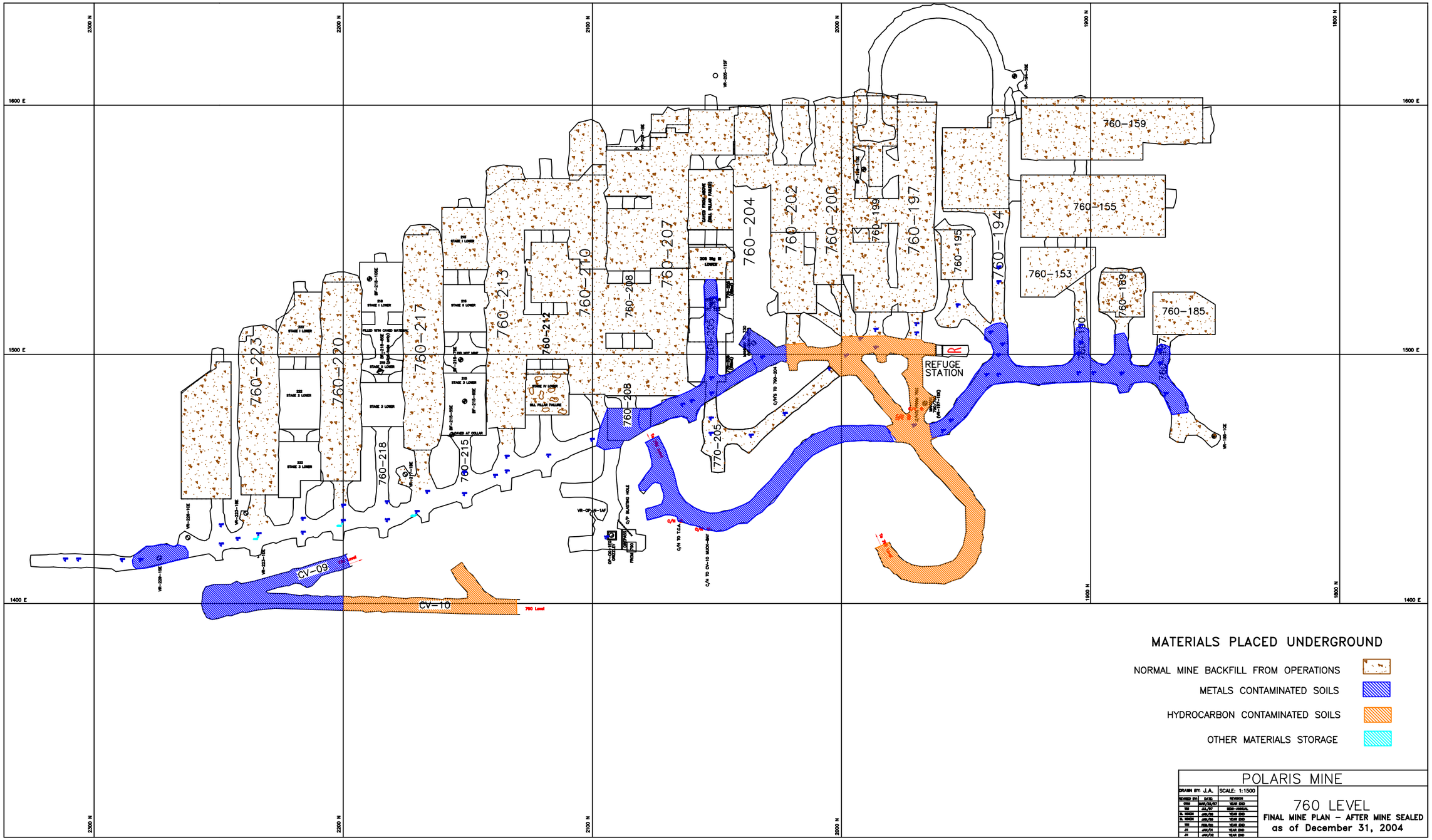
- NORMAL MINE BACKFILL FROM OPERATIONS
- METALS CONTAMINATED SOILS
- HYDROCARBON CONTAMINATED SOILS
- OTHER MATERIALS STORAGE

POLARIS MINE

DRAWN BY: J.A.	SCALE: 1:1500
REVISED BY:	DATE:

730 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004



MATERIALS PLACED UNDERGROUND

- NORMAL MINE BACKFILL FROM OPERATIONS
- METALS CONTAMINATED SOILS
- HYDROCARBON CONTAMINATED SOILS
- OTHER MATERIALS STORAGE

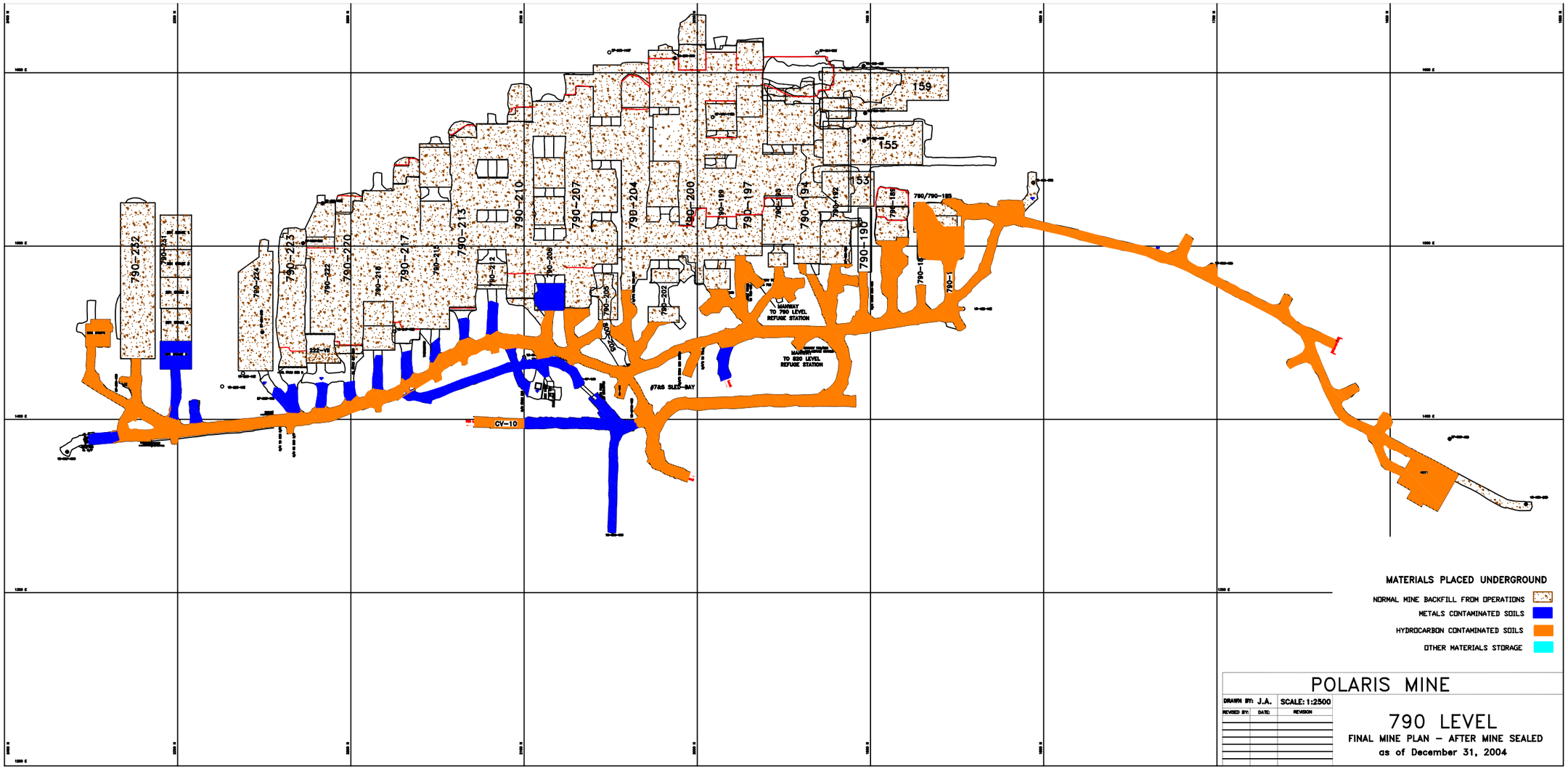
POLARIS MINE

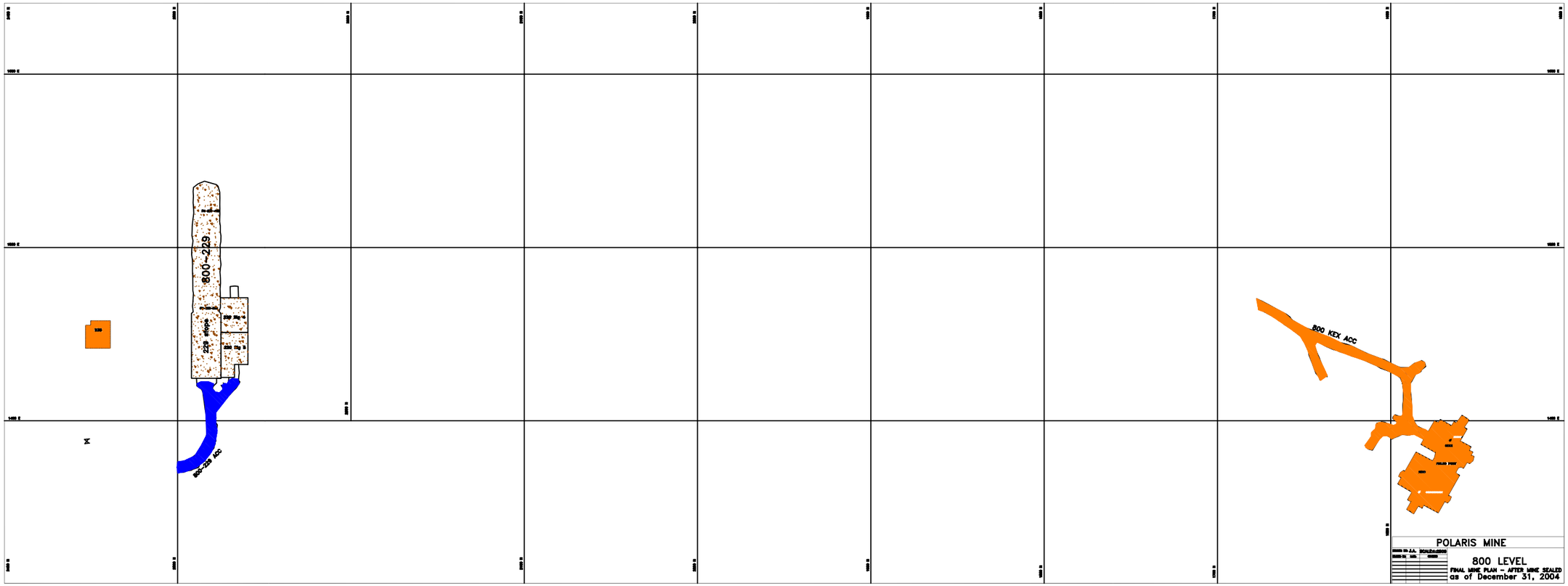
DRAWN BY: J.A. SCALE: 1:1500

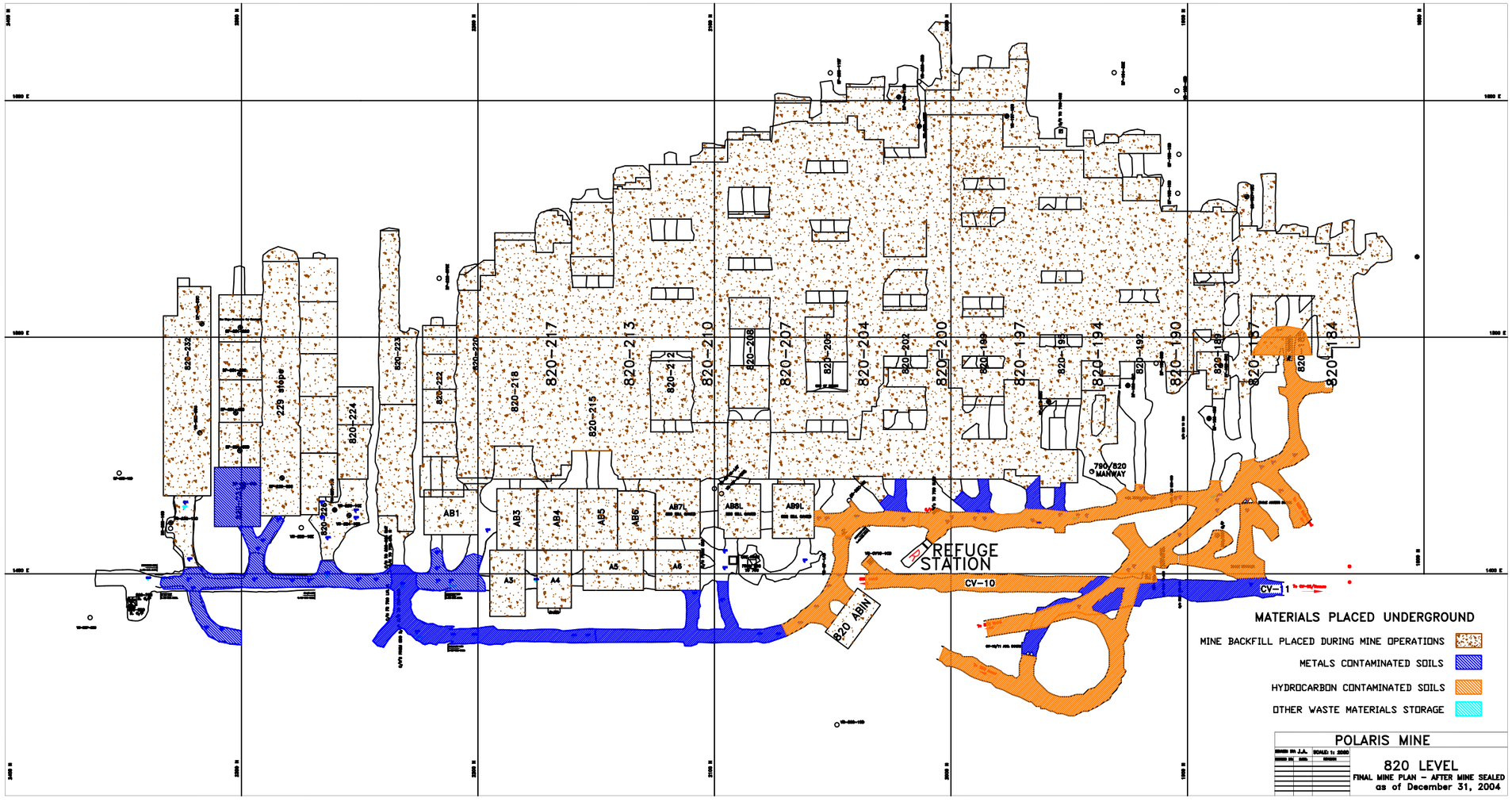
REVISED BY	DATE	REVISION
CRM	MAR/05/97	YEAR END
MJ	JUL/97	SEMI-ANNUAL
M. MOON	JAN/98	YEAR END
M. MOON	JAN/99	YEAR END
MR	FEB/00	YEAR END
JH	JAN/01	YEAR END
JH	JAN/02	YEAR END

760 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED as of December 31, 2004


790-252
790-223
790-220
790-217
790-213
790-210
790-207
790-204
790-200
790-197
790-194
790-190
790-1
159
155
153
780/790-185
MANWAY
TO 790 LEVEL
REFUSE STATION
MANWAY
TO 820 LEVEL
REFUSE STATION
6785 SUMP
CV-10
MATERIALS PLACED UNDERGROUND
NORMAL MINE BACKFILL FROM OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER MATERIALS STORAGE
POLARIS MINE
DRAWN BY: J.A.
SCALE: 1:2500
REVISED BY:
DATE:
REVISION
790 LEVEL
FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004


800-229
800-229 ACC
800 KEK ACC
POLARIS MINE
800 LEVEL
FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004


820-232
229 stope
820-224
820-223
820-222
820-220a
820-218
820-217
820-215
820-213
820-212
820-210
820-208
820-207
820-205
820-204
820-202
820-200
820-198
820-197
820-194
820-192
820-190
820-188
820-157
820-184
820-226
AB1
AB3
AB4
AB5
AB6
AB7L
AB8L
AB9L
A3
A4
A5
A6
790/820 MANWAY
REFUGE STATION
CV-10
CV-11
820 ABIN
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
POLARIS MINE
820 LEVEL
FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004

2000 N
1900 N
1800 N
1700 N
1600 E
1500 E
1400 E

850/820–187
850/820–185
850/820–184
825–181
825–152
825–150
825–185
825–176
825–172
C/H FROM 850
CV–11
CV–12

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER WASTE MATERIALS STORAGE

POLARIS MINE

DRAWN BY: J.A.	SCALE 1:1250
REVISED BY:	DATE: / REVISION

825 SUBLEVEL

FINAL MINE PLAN – AFTER MINE SEALED

as of December 31, 2004

850 NORTH LEVEL

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER WASTE MATERIALS STORAGE

POLARIS MINE

850 LEVEL SOUTH

FINAL MINE PLAN – AFTER MINE SEALED

as of December 31, 2004

Mak Parts
Pump
Compressor
Hydraulic Pack

880–145
880–142
880–141
880–139
880–137
880–135
880–133
880–128
880–125W
880–124W
NP–140
NP–142
NP–227
NP–229
NP–231
880 DUMP
133 Stp 1
133 Stp 2
133 Stp 3
135 Stp 5
128 Stp 3

880–223
880–220
880–217
880–213
880–210
880–207
880–204
880–200
880–197
880–194
880–190
880–187
880–184
880–181
880–178

AB1
AB2
AB3
AB4
AB5
AB6
AB7
AB8
AB9
AB10
AB11
AB12
AB13
AB14
AB15
AB16
AB17
AB19
AB20

A STOPE
A/B UNDERCUT
B STOPE
B/C UNDERCUT

105–7
105–6

Tires, Steel
& Pallets

Tailings Lines

SLED–BAY

LADDER UP TO
REFUGE STATION

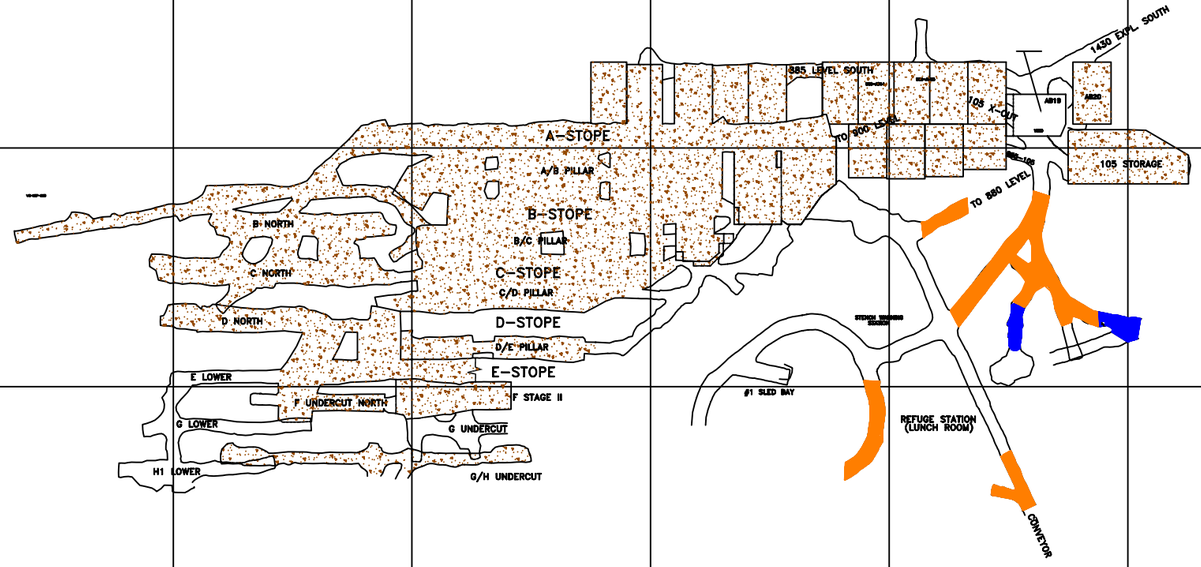
REFUGE STATION
NEXT RIGHT

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE

POLARIS MINE

880 LEVEL SOUTH
FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004



MATERIALS PLACED UNDERGROUND

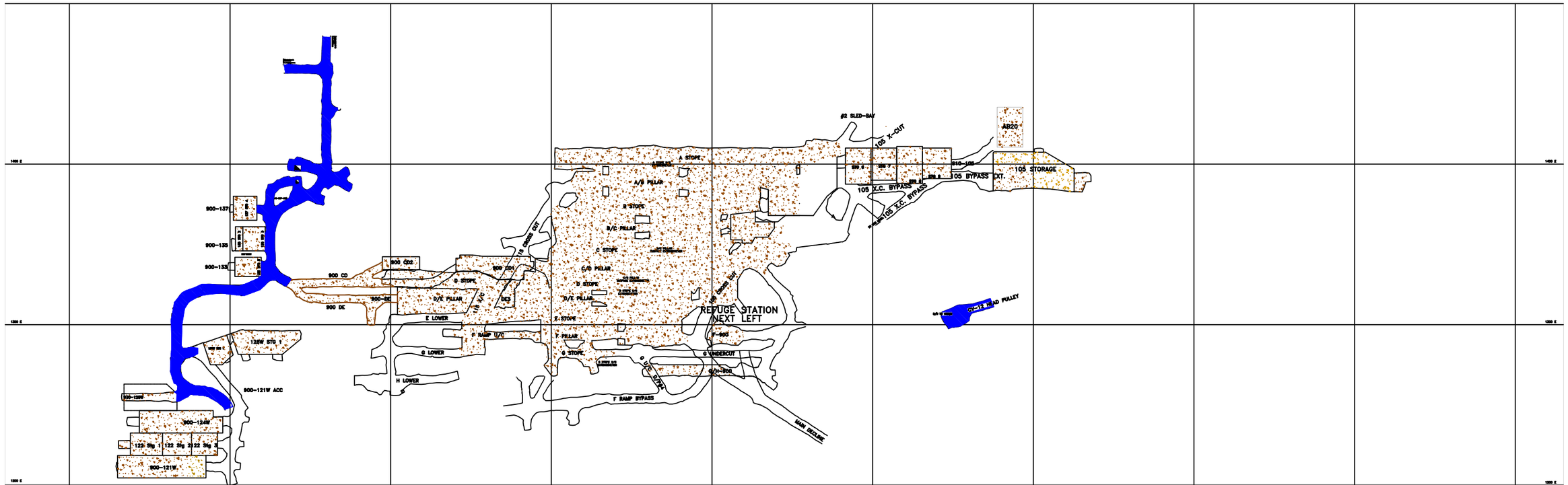
- MINE BACKFILL PLACED DURING MINE OPERATIONS
- METALS CONTAMINATED SOILS
- HYDROCARBON CONTAMINATED SOILS
- OTHER WASTE MATERIALS STORAGE

POLARIS MINE

DRAWN BY:	J.A.	SCALE:1:2500
REVISED BY:	DATE:	REVISION

885 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004



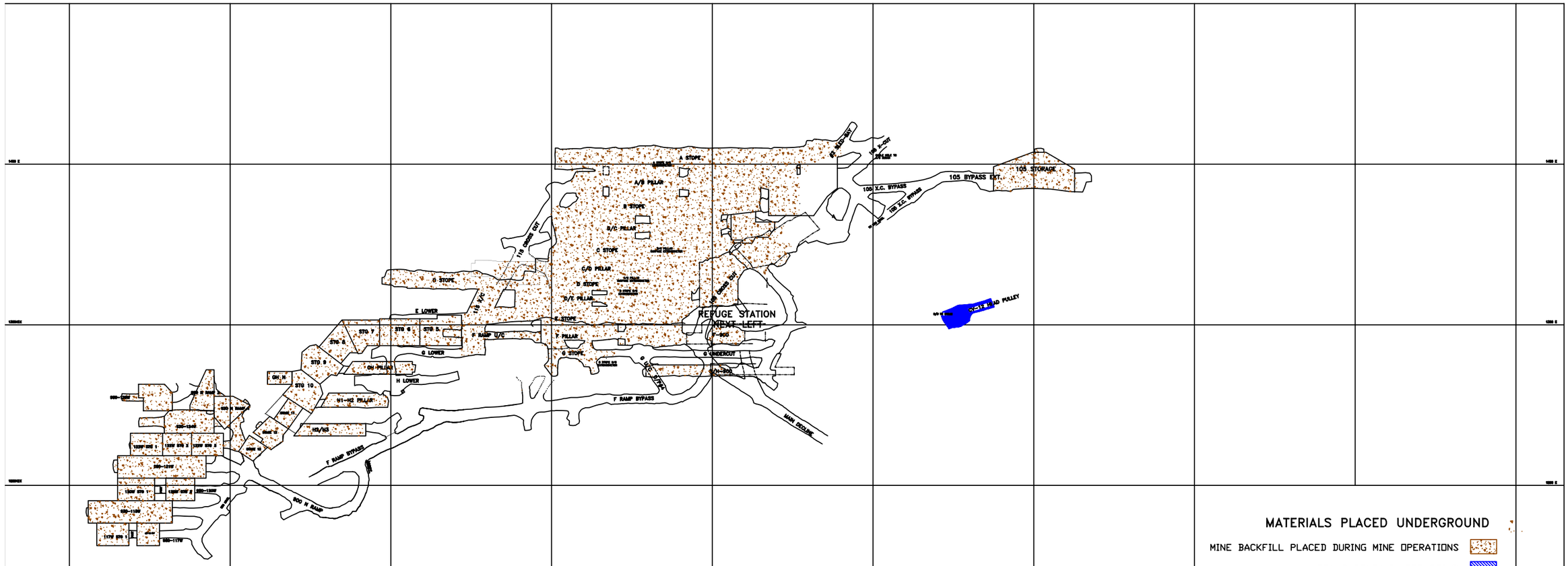
POLARIS MINE

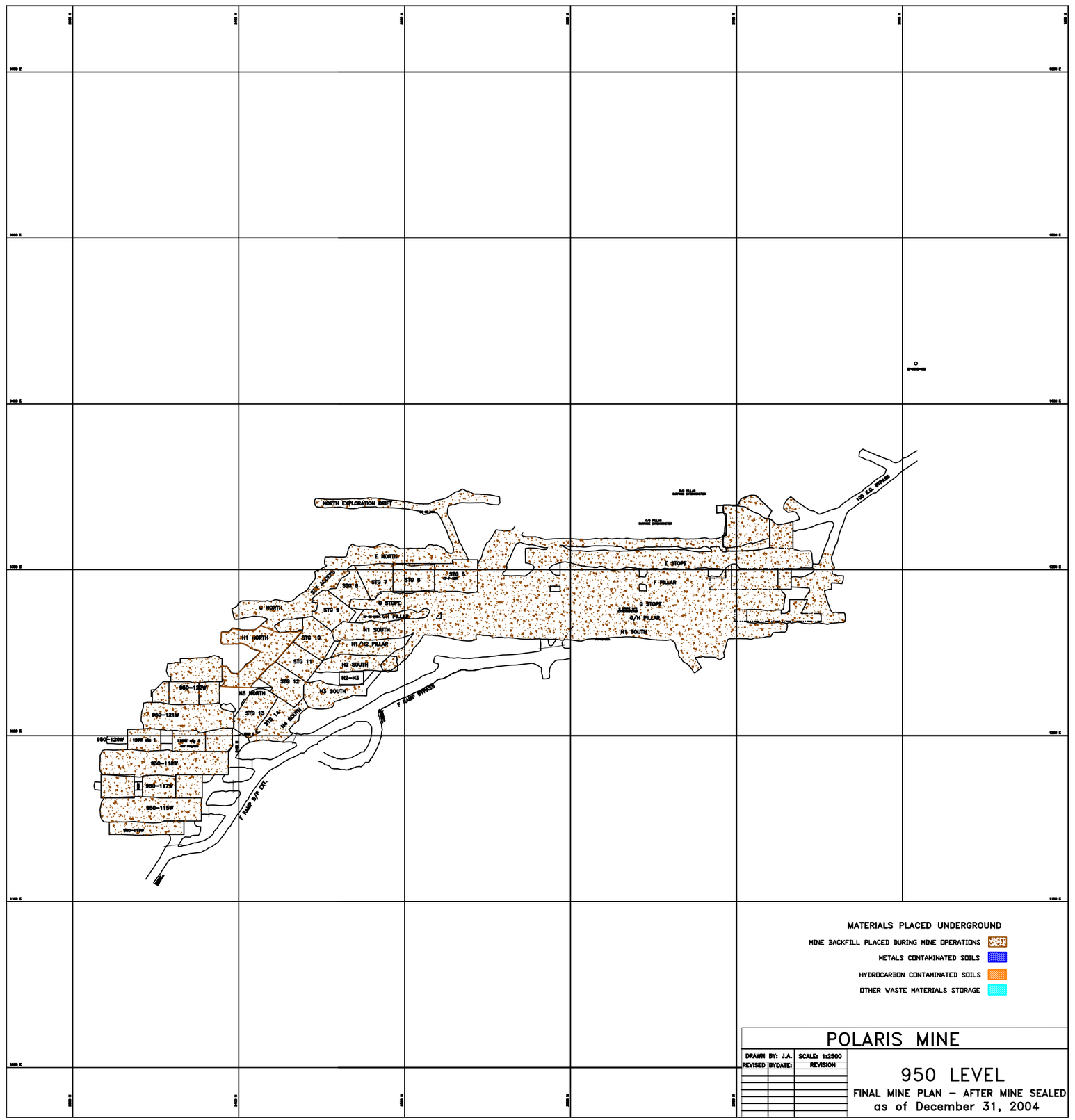
DRAWN BY: J.A. SCALE: 1:2500

SURVEYED BY:	DATE:	REVISIONS

900 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004


A STOPE
A/B PILLAR
B STOPE
B/C PILLAR
C STOPE
C/D PILLAR
D STOPE
D/E PILLAR
E STOPE
F PILLAR
G STOPE
G UNDERCUT
F-900
G/H-900
REFUGE STATION
NEXT LEFT
105 STORAGE
105 BYPASS EXT.
105 X.C. BYPASS
105 X.C. BYPASS
105 RAISE EXT
105 RAISE EXT
105 RAISE EXT
105 X-CUT
105 W/C
F RAMP U/C
F RAMP BYPASS
G UNDERCUT
MAIN INCLINE
E LOWER
G LOWER
H LOWER
STO 5
STO 6
STO 7
STO 8
STO 9
STO 10
OH-PILLAR
OH-H
H1-H2 PILLAR
H2/H3
F RAMP BYPASS
900 N. RAMP
1275' STO 1
1275' STO 2
1250' STO 1
1250' STO 2
1225' STO 1
1225' STO 2
1200' STO 1
1200' STO 2
1175' STO 1
1175' STO 2
900-1250
900-1225
900-1200
900-1175
900-1150
900 N RAMP
900 S RAMP
900 W RAMP
900 E RAMP
STO 11
STO 12
STO 13
STO 14
STO 15
STO 16
STO 17
STO 18
STO 19
STO 20
STO 21
STO 22
STO 23
STO 24
STO 25
STO 26
STO 27
STO 28
STO 29
STO 30
STO



MATERIALS PLACED UNDERGROUND

- MINE BACKFILL PLACED DURING MINE OPERATIONS
- METALS CONTAMINATED SOILS
- HYDROCARBON CONTAMINATED SOILS
- OTHER WASTE MATERIALS STORAGE

POLARIS MINE

DRAWN BY: J.A.		SCALE: 1:2500
REVISED	BY	DATE: REVISION

950 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004

2500 N
2500 N
2400 N
2300 N
2200 N
1300 E
1300 E
1200 E
1200 E
960 F
960–120W
960–118W
960–117W
960–115W
960–113W
Tailings Line Storage Area
1100 E
1100 E
2300 N
2500 N
2500 N
2400 N
2300 N

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER WASTE MATERIALS STORAGE

POLARIS MINE

DRAWN BY: MJH	SCALE: 1:1500
REVISED BY:	DATE:

960 LEVEL

FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004

PORTAL PLUG

MACHINERY AND TELEPHONE POLES

NORTH PORTAL

ANFO PLANT

#4 SLED-BAY

FUEL BAY (1000 GAL)

ANFO STORAGE

MAIN DECLINE

STEEL SETS

MACHINERY

BAGS OF LIME

CV-01 CONVEYOR

JUNE 2003 MELT WATER STORAGE AREA

COB #1

CV-02 CONVEYOR

MAIN DECLINE

MACHINERY

PORTAL PLUG

PORTAL PLUG

PORTAL PLUG

CV-03

7# EXPLORATION RAISE

MATERIALS PLACED UNDERGROUND

- MINE BACKFILL PLACED DURING MINE OPERATIONS
- METALS CONTAMINATED SOILS
- HYDROCARBON CONTAMINATED SOILS
- OTHER WASTE MATERIALS STORAGE

POLARIS MINE

DRAWN BY: J.A. | SCALE: NTS

REVISED BY:	DATED:	REVISION

980 LEVEL

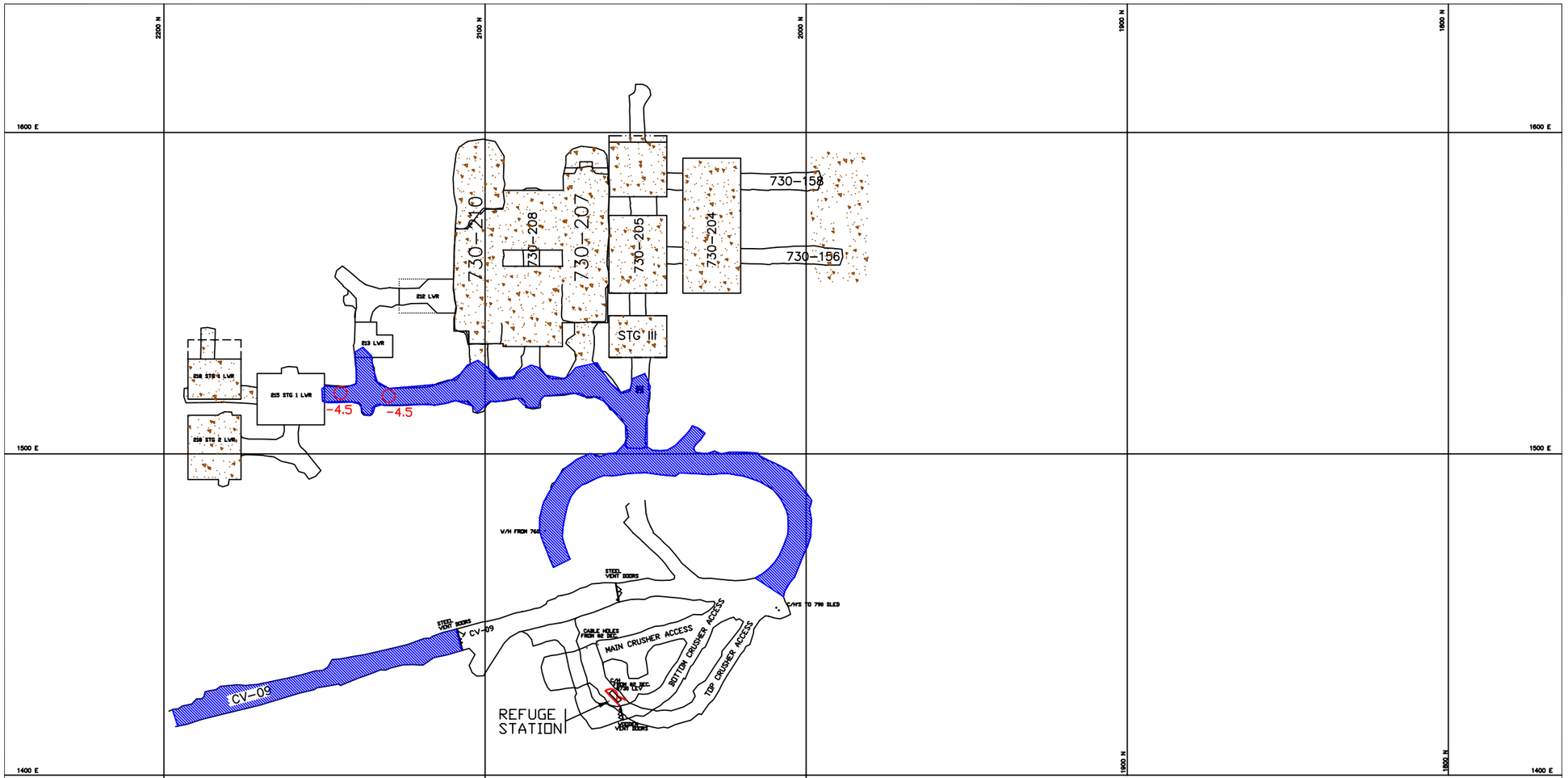
FINAL MINE PLAN – AFTER MINE SEALED
as of December 31, 2004

APPENDIX 12

ROCK TEMPERATURES SURROUNDING

THE

UNDERGROUND MINE WORKINGS



MATERIALS PLACED UNDERGROUND

NORMAL MINE BACKFILL FROM OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER MATERIALS STORAGE

ROCK TEMPERATURE -5.5

POLARIS MINE

DRAWN BY: J.A. SCALE: 1:500

REVISED BY:	DATE:	REVISION
GMM	MAR/02/07	YEAR END
NM	JUL/07	SEMI-ANNUAL
GL MINOR	JAN/08	YEAR END
GL MINOR	JAN/09	YEAR END
NM	FEB/09	YEAR END
NLB	JAN/01	YEAR END
JH	JAN/10	YEAR END

730 LEVEL

Contamination Placement
as of December 31, 2003

2300 N
2200 N
2100 N
2000 N
1900 N
1800 N
1600 E
1500 E
1400 E

760-223
760-220
760-217
760-218
760-215
760-213
760-212
760-210
760-208
760-207
760-208
760-205
770-205
760-204
760-202
760-200
760-198
760-197
760-195
760-194
760-159
760-155
760-153
760-189
760-185
760-190
760-187

REFUGE STATION

-5.4

CV-09
CV-10

MATERIALS PLACED UNDERGROUND

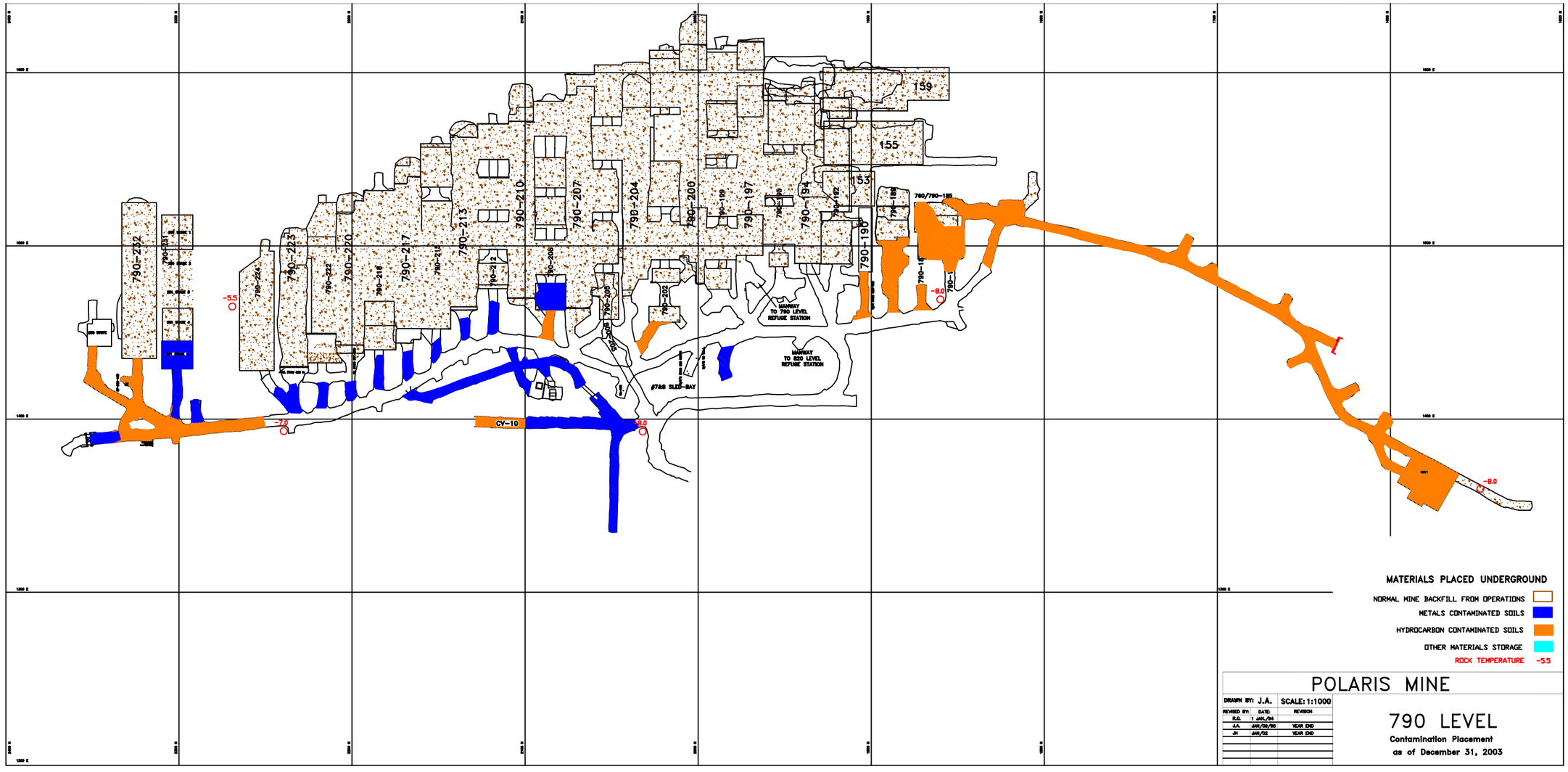
NORMAL MINE BACKFILL FROM OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER MATERIALS STORAGE
ROCK TEMPERATURE -5.5

POLARIS MINE

DRAWN BY: J.A. SCALE: 1:500

REVISED BY	DATE	REVISION
GMH	MAR/22/07	YEAR END
TEC	JUL/07	SEDI-MANUAL
N. HAKEN	JAN/08	YEAR END
N. HAKEN	JAN/09	YEAR END
TEC	FEB/09	YEAR END
JH	JAN/01	YEAR END
JH	JAN/02	YEAR END

760 LEVEL
Contamination Placement
as of December 31, 2003



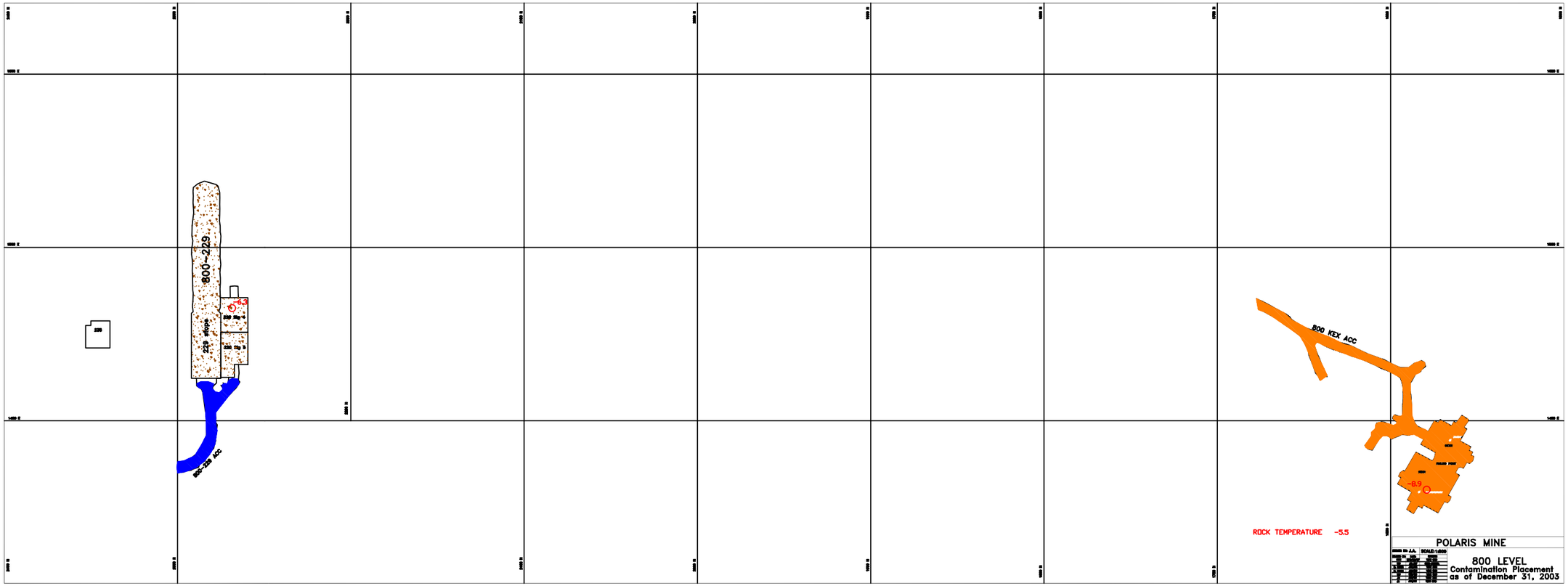
POLARIS MINE

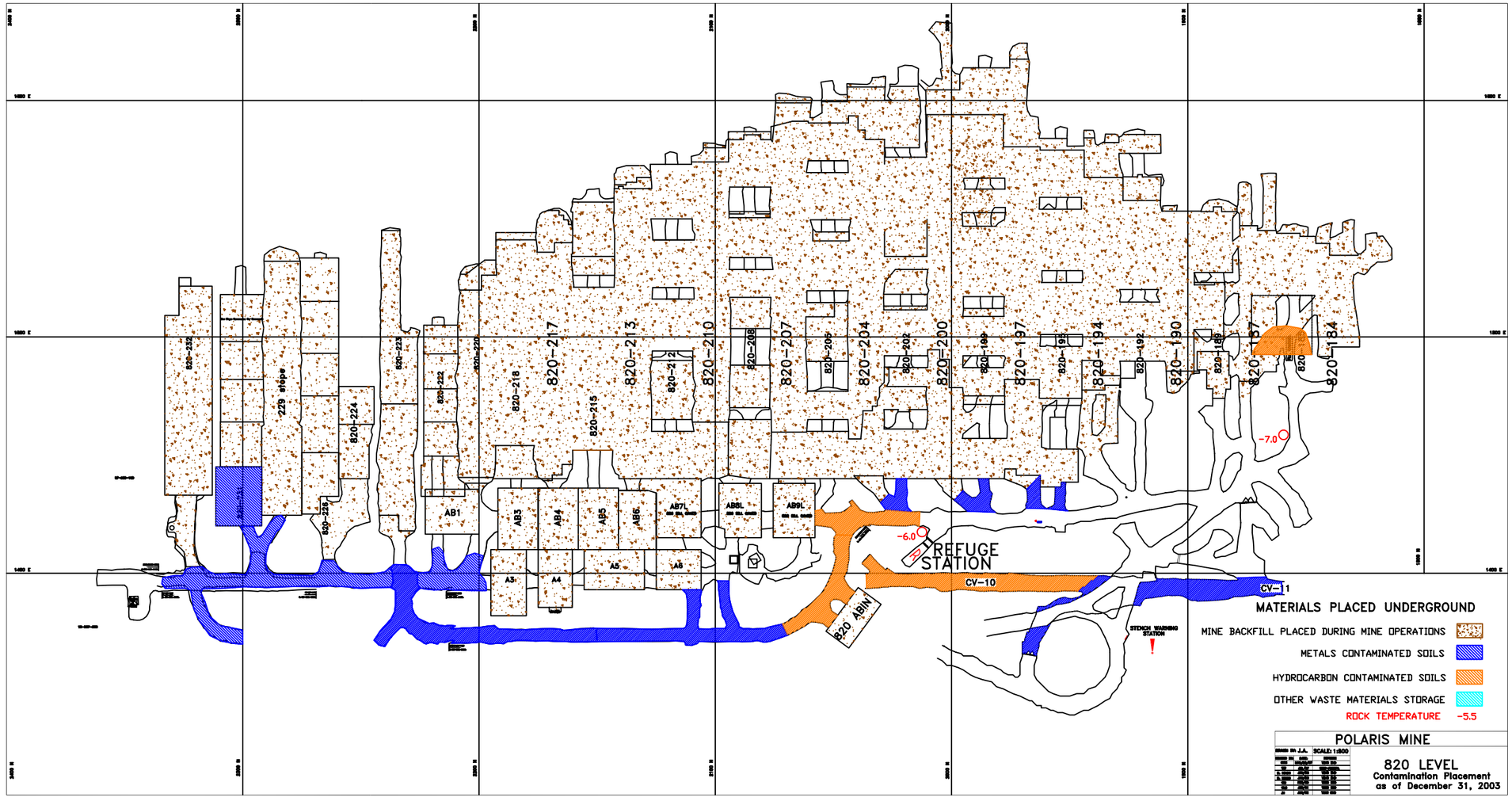
DRAWN BY: J.A. SCALE: 1:1000

REVISED BY:	DATE:	REVISION
R.G.	1 JAN./04	
J.A.	JAN/03/03	YEAR END
JH	JAN/02	YEAR END

790 LEVEL

Contamination Placement
as of December 31, 2003


800-229
229 stope
800-229 ACC
800 KEX ACC
-8.9
ROCK TEMPERATURE -5.5
POLARIS MINE
800 LEVEL
Contamination Placement
as of December 31, 2003


820-232
229 stope
820-224
820-225
820-223
820-222
820-220
820-218
820-217
820-215
820-213
820-212
820-210
820-208
820-207
820-205
820-204
820-202
820-200
820-199
820-197
820-195
820-194
820-192
820-190
820-188
820-187
820-185
820-184
AB1
AB3
AB4
AB5
AB6
AB7L
AB8L
AB9L
A3
A4
A5
A6
-7.0
-6.0
REFUGE STATION
CV-10
CV-11
820 ABIN
STENCH WARNING STATION
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
ROCK TEMPERATURE -5.5
POLARIS MINE
820 LEVEL
Contamination Placement
as of December 31, 2003

850 NORTH LEVEL

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER WASTE MATERIALS STORAGE

ROCK TEMPERATURE -5.5

POLARIS MINE

850 LEVEL SOUTH

Contamination Placement

as of December 31, 2003

Mak Parts
Pump
Compressor
Hydraulic Pack

880-145
880-142
880-141
880-139
880-137
880-135
880-133
880-128
880-125W
880-124W
880-223
880-220
880-217
880-213
880-210
880-207
880-204
880-200
880-197
880-194
880-190
880-187
880-184
880-181
880-178
NP-231
NP-229
NP-227
NP-142
NP-140
880 DUMP
A STOPE
A/B UNDERCUT
B STOPE
B/C UNDERCUT
105-6
105-7
AB19
Tires, Steel
& Pallets
Tailings Lines
SLED-BAY
LADDER UP TO
REFUGE STATION
REFUGE STATION
NEXT RIGHT
-5.8
-6.3
-6.0
-5.8

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
ROCK TEMPERATURE -5.5

POLARIS MINE

880 LEVEL SOUTH
Contamination Placement
as of December 31, 2003

MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER WASTE MATERIALS STORAGE

ROCK TEMPERATURE -5.5

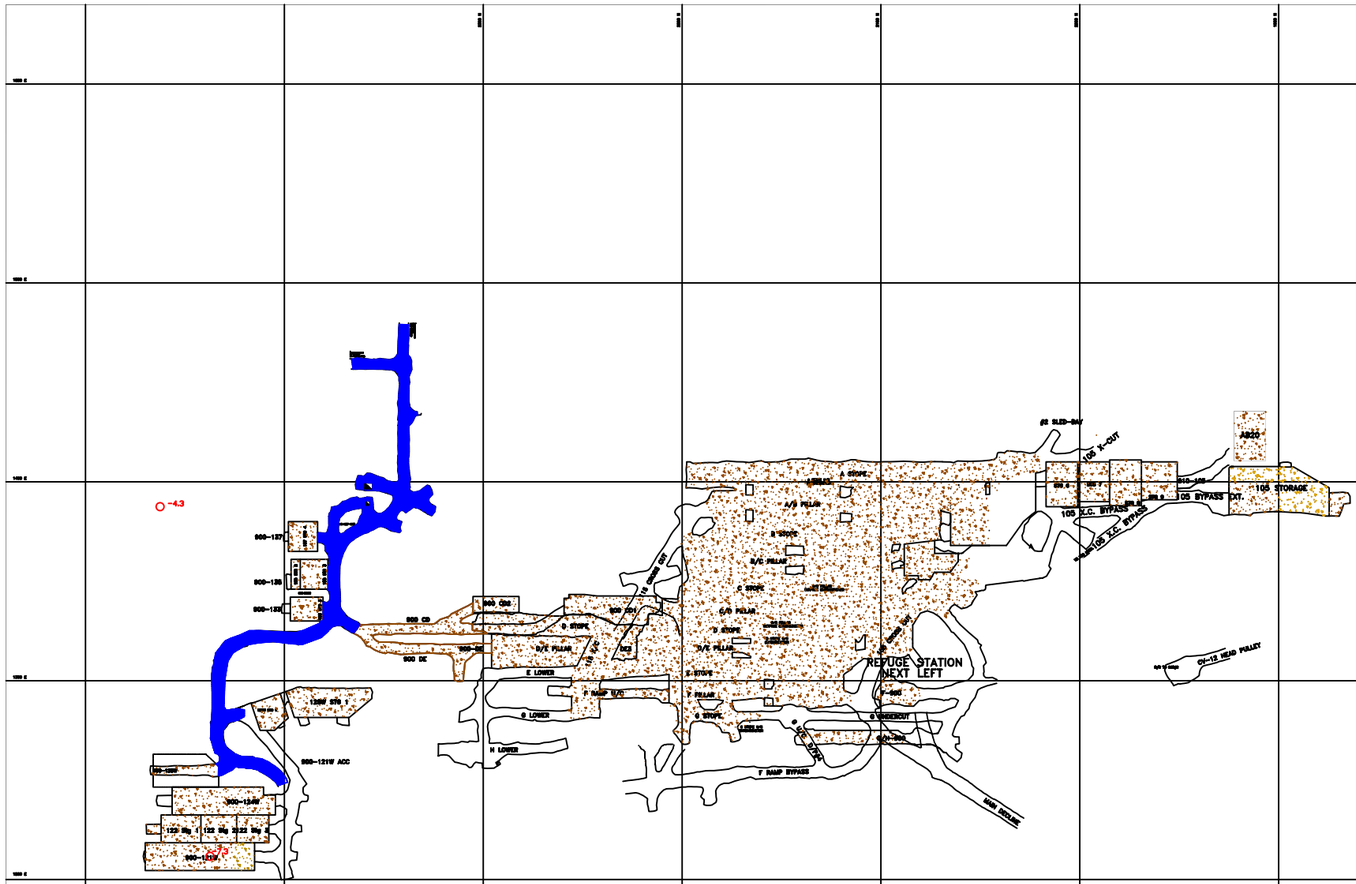
POLARIS MINE

DRAWN BY: J.A. SCALE:1:1000

REVISED BY:	DATE	REVISION
R.A.	1 JAN./04	
J.A.	JAN./05/05	YEAR END

885 LEVEL

Contamination Placement as of December 31, 2003



MATERIALS PLACED UNDERGROUND

MINE BACKFILL PLACED DURING MINE OPERATIONS

METALS CONTAMINATED SOILS

HYDROCARBON CONTAMINATED SOILS

OTHER WASTE MATERIALS STORAGE

ROCK TEMPERATURE -5.5

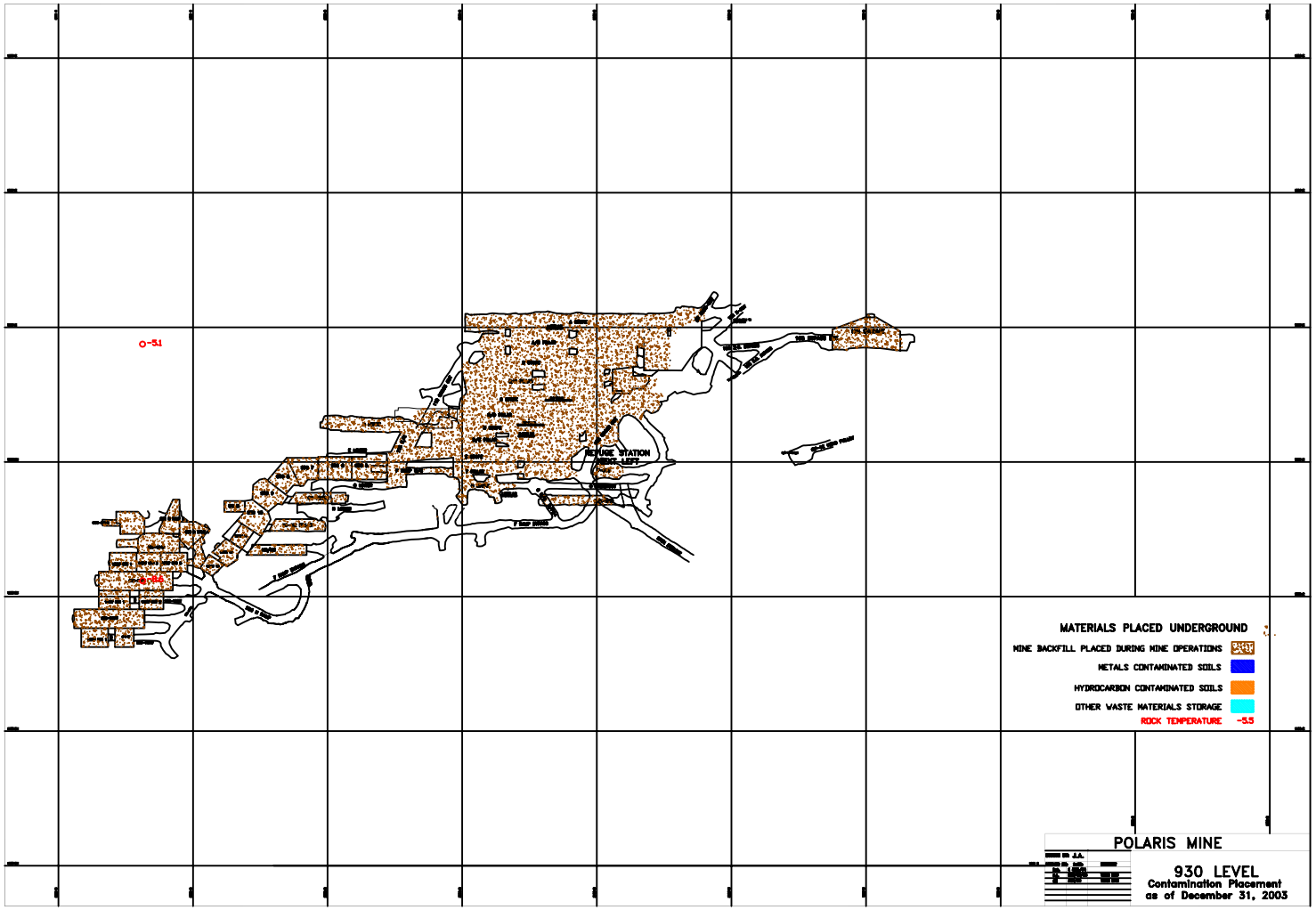
POLARIS MINE

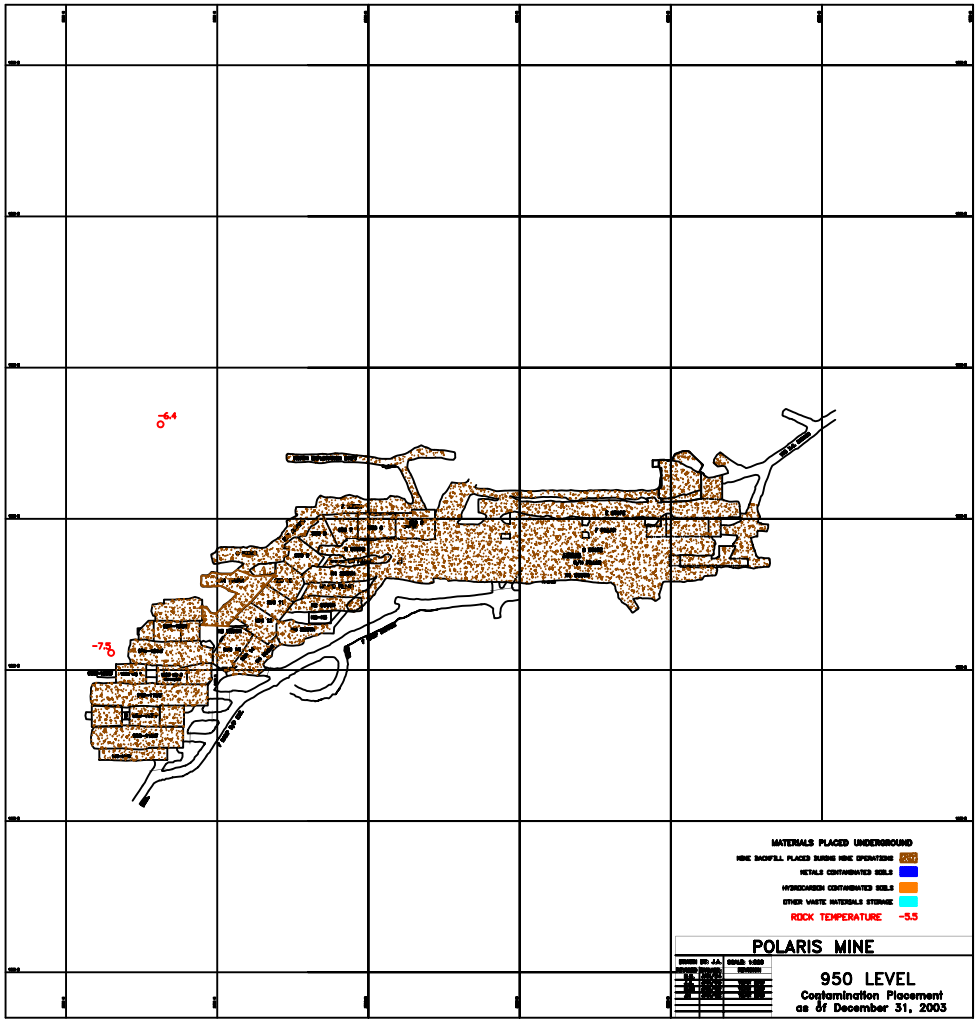
DRAWN BY: J.A. SCALE: 1:1000

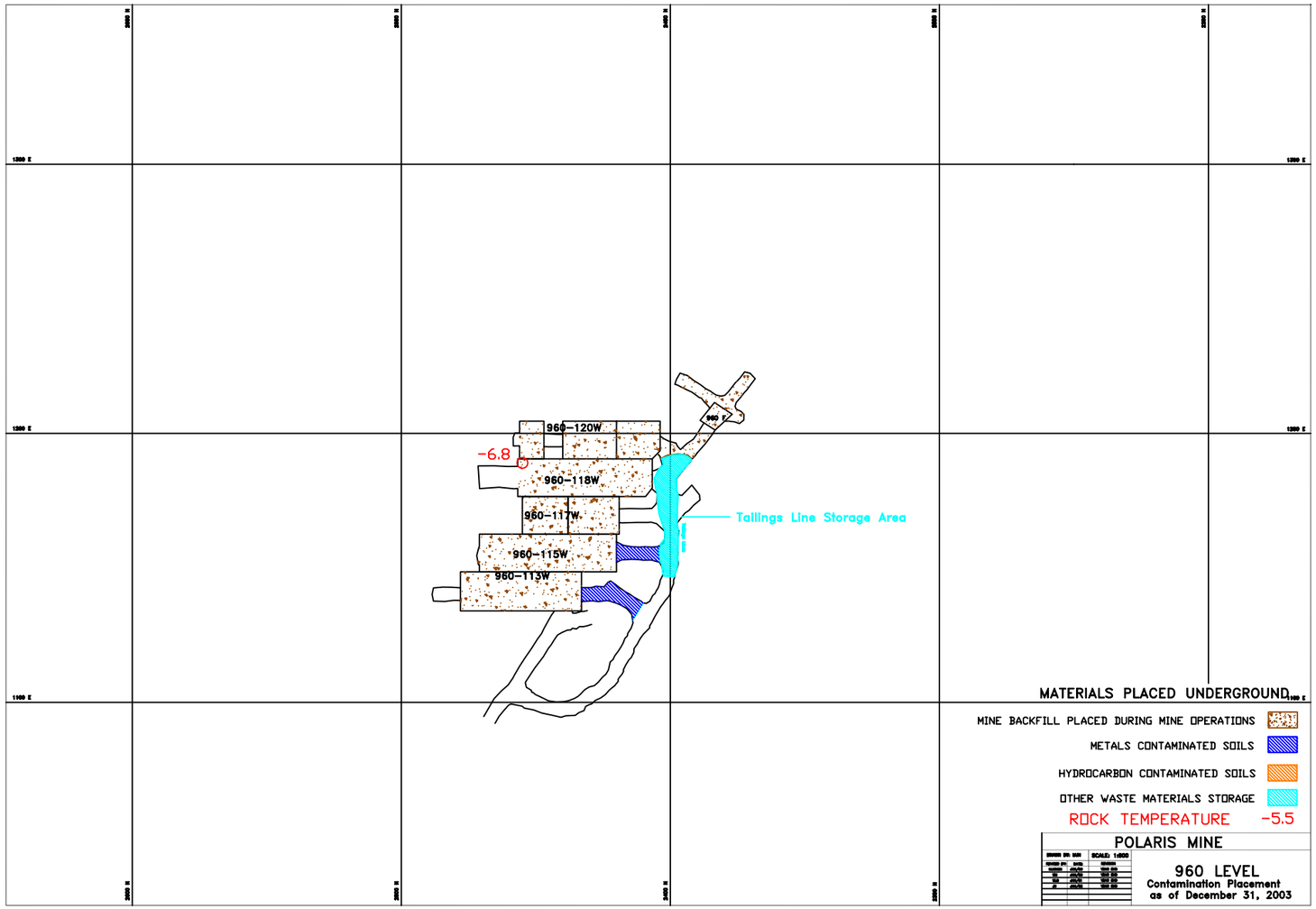
J.A.	2005/09/09	1000 ORE
JH	2005/12	1000 ORE

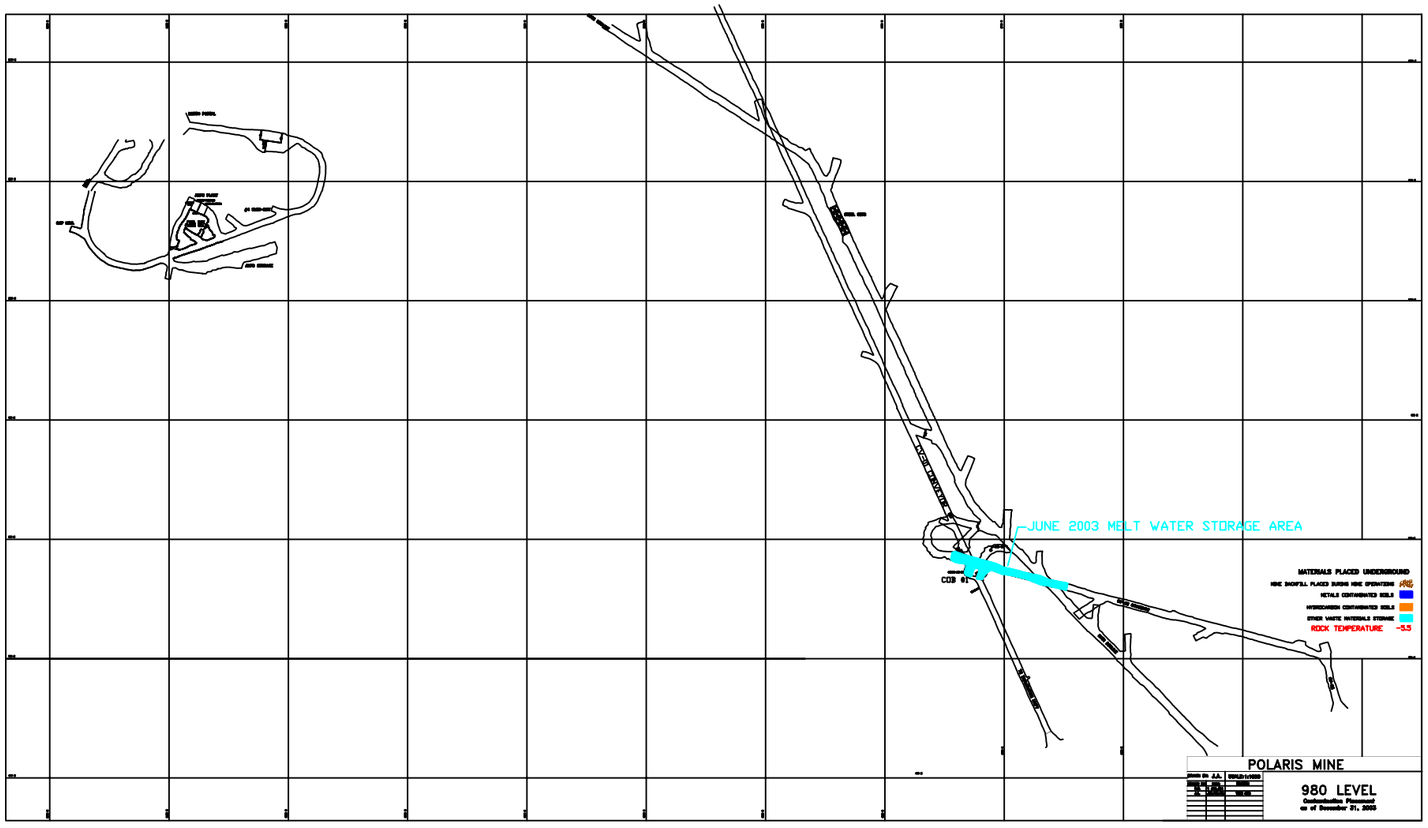
900 LEVEL

Contamination Placement
as of December 31, 2005


MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
ROCK TEMPERATURE -5.5
POLARIS MINE
930 LEVEL
Contamination Placement
as of December 31, 2003


-6.4
-7.5
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
ROCK TEMPERATURE -5.5
POLARIS MINE
950 LEVEL
Contamination Placement
as of December 31, 2003


960-120W
960-118W
960-117W
960-115W
960-113W
-6.8
Tailings Line Storage Area
MATERIALS PLACED UNDERGROUND
MINE BACKFILL PLACED DURING MINE OPERATIONS
METALS CONTAMINATED SOILS
HYDROCARBON CONTAMINATED SOILS
OTHER WASTE MATERIALS STORAGE
ROCK TEMPERATURE -5.5
POLARIS MINE
960 LEVEL
Contamination Placement
as of December 31, 2003


JUNE 2003 MELT WATER STORAGE AREA
CDB 01
MATERIALS PLACED UNDERGROUND
ROCK TEMPERATURE -3.5
POLARIS MINE
980 LEVEL
Condemnation Placement
as of December 31, 2003

APPENDIX 13

GARROW LAKE EROSION MONITORING

2004 GARROW LAKE EROSION MONITORING PINS

The data recorded in the attached table for the Erosion monitoring pin at Station 10 on July 17, 2004 is incorrect. Not sure whether the wrong pin was measured or if the data was just incorrectly recorded.

However, there is sufficient data to compare 2004 data to 2003 data. There is no sign of erosion at any of the locations being monitored.

There were no pictures or measurements of the erosion pins taken in either June or September due to snow conditions around the lake. In July obtained pictures and measurements of three of the four pins and in August obtained measurements and photographs of all pins.

Pin measurements indicate no significant movements occurred during either of 2003 or 2004.

GARROW LAKE EROSION MONITORING PINS

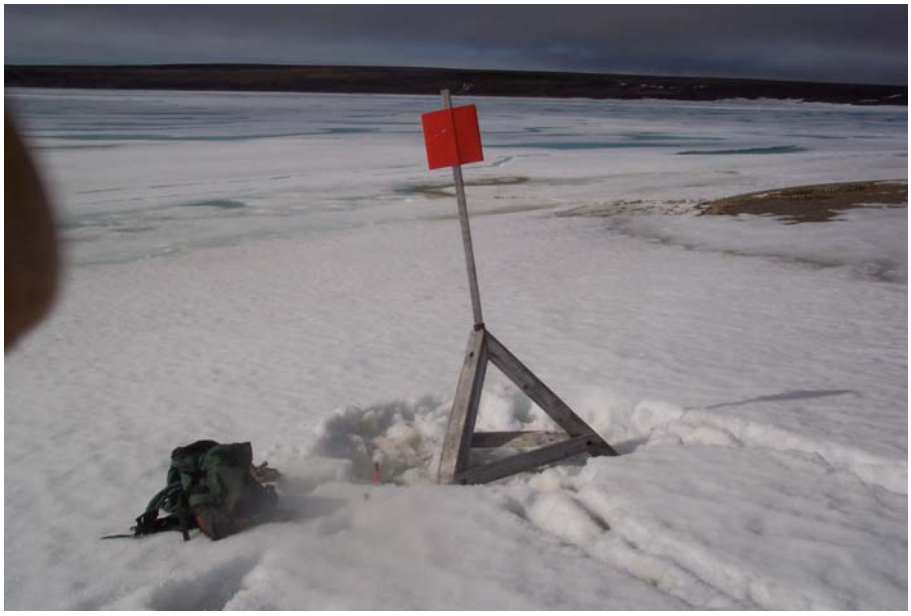
Month	Distance (cm) - Top of Pin to Ground				Photographs Taken
	Stn. 8	Stn. 9	Stn. 10	Stn. 11	
Jul-03	56.5	45	61.5	50	Yes
Aug-03	56.5	45	61.5	50	Yes
Sep-03	56.5	44	61	50	Yes
Jun-04	n.a.	n.a.	n.a.	n.a.	No
17-Jul-04	57.0	n.a.	17.5	50.7	Yes (2 only)
18-Aug-04	56.5	45.1	61.5	50.7	Yes but can't locate
Sep-04	n.a.	n.a.	n.a.	n.a.	No

Station # 8 - Garrow Lake North Quadrant
Station # 9 - Garrow Lake East Quadrant
Station # 10 - Garrow Lake South Quadrant
Station # 11 - Garrow Lake West Quadrant

Note 1 - distance measured is along the side of the pin (not vertical distance)
Note 2 - "Not Available" - Can not measure pin as either buried in snow or obstructed by ice

JULY 2004 PHOTOGRAPHS

Erosion Pin Station # 8 – July 17, 2004



Erosion Pin Station #9 – July 17, 2004

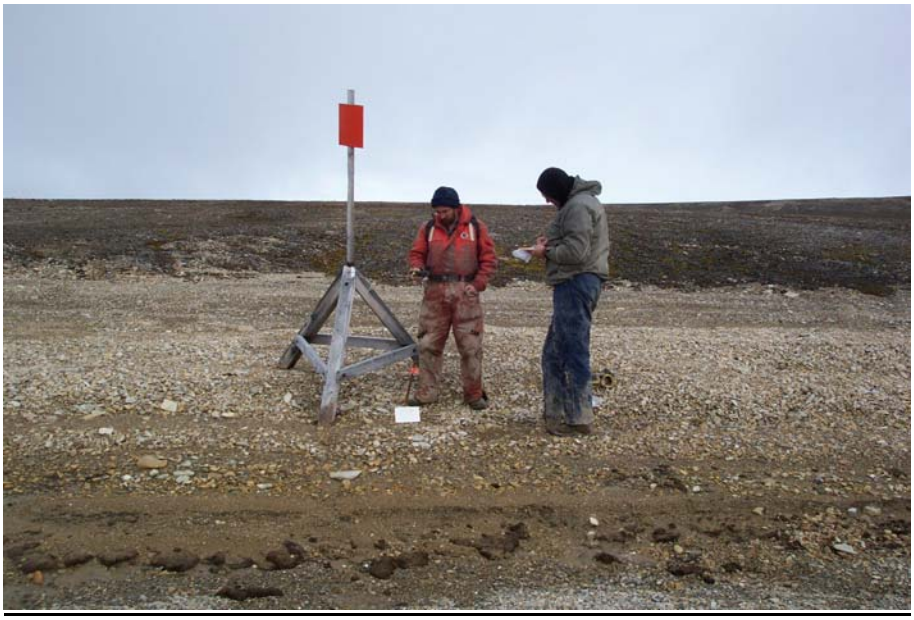
JULY 2004 PHOTOGRAPHS

Erosion Pin # 11 – July 17, 2004

AUGUST 2004 PHOTOGRAPHS

Erosion Pin Station #8 - August 18, 2004

AUGUST 2004 PHOTOGRAPHS



Erosion Pin Station #9 – August 18, 2004

Erosion Pin Station #10 – August 18, 2004

AUGUST 2004 PHOTOGRAPHS

Erosion Pin Station 11 – August 18, 2004

APPENDIX 14

GARROW CREEK EROSION MONITORING

GARROW CREEK EROSIONG MONITORING – POST DAM DECOMMISSIONING

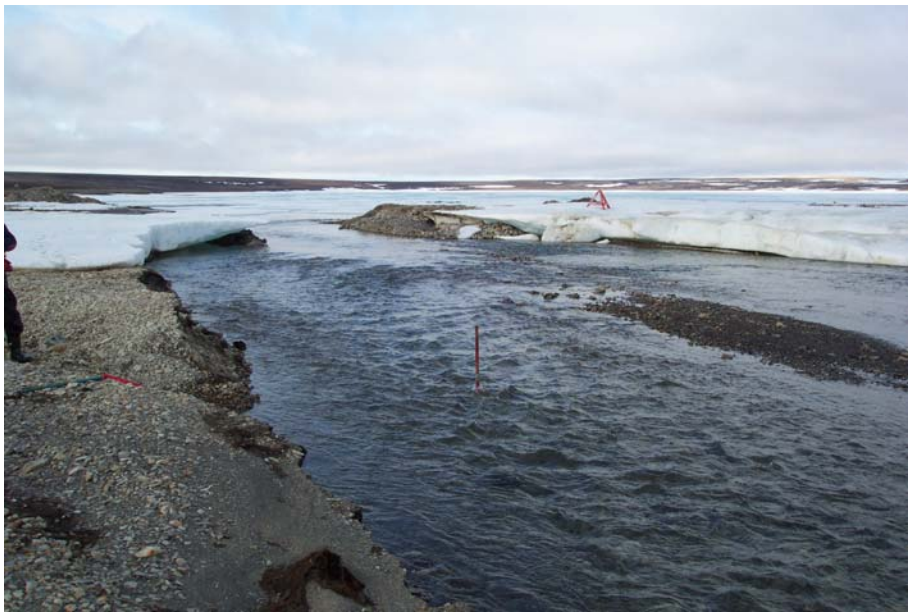
Approvals for the decommissioning of the Garrow dam included monitoring requirements when there were surface flows the first summer the dam was decommissioned. Monitoring included:

1. Erosion Monitoring using rebar pins in the creek bed that are measured weekly during the period of flow,
2. TSS sampling weekly during the period of flow,
3. Photographic records of the creek flow from established locations weekly during the period of flow, and
4. Photographic record at regular intervals along the length of the creek once at the end of the discharge season to document conditions.

1. EROSION MONITORING PINS

Three rebar pins were placed into the creek channel to monitor for erosion of the creek bottom (see photographs below). One pin was placed near the outlet of Garrow Lake, one about midway between the lake and the ocean, and one near the outlet of the creek into the ocean.

Below are photographs of each of the three pins.



Station 12 – Near the outlet of Garrow Lake

Station 13 – Midway between Garrow Lake and the Ocean

Station 14 – Near the Outlet of the Creek into the Ocean

On a weekly basis starting on July 16th, measurements were taken from the top of the pin to the creek bottom. Any erosion of the channel bottom at the location of the pin would be identified by the distance from the top of the pin to the creek bed. The measurements taken during the flow period seem to suggest that the bed of the creek was dynamic and in the case of two of the three monitoring stations, indicated some deposition of material in the stream bed.

GARROW CREEK - EROSION MONITORING DURING DAM DECOMMISSIONING

Station	Location	Date	Height of Pin above Gnd/ Creek Bed (mm)	Height of Water above Creek Bed (mm)	Erosion since date set (mm)	UTM 14 Coords		Comments
12	Garrow Creek - near outlet of Garrow Lake	July 16 2004	1000	350		561605	8367448	Set erosion pin 2.5m east of west bank. Set at 5:00 pm. See photo
		July 20 2004	980	280	20			
		July 27 2004	980	100	20			Wavebreak channel plugged to control flow. Water from lake is not flowing into creek.
		August 3 2004	995	30	5			
		August 10, 2004	995	35	5			
		August 17, 2004	1000	30	0			
		August 21, 2004	1000	30	0			
13	Garrow Creek - midway between Garrow Lake and Garrow Bay	July 16 2004	830	370		561730	8366764	Set erosion pin 9.0 m east of west bank. Set at 5:00 pm. See photo
		July 20 2004	800	260	30			see photo
		July 20 2004	800	110	30			
		August 3 2004	790	25	40			
		August 10, 2004	785	65	45			
		August 17, 2004	790	70	40			
		August 21, 2004	805	80	25			
14	Near mouth of Garrow Garrow Creek discharging into Garrow Bay	July 17 2004	550	300		561925	8366248	Set erosion pin approx. 50 ft from mouth of Garrow Bay. Set at 5:00 pm See photo
		July 20 2004	550	420	0			see photo
		July 24 2004	535	40	15			
		August 3 2004	530	30	20			
		August 10, 2004	530	25	20			
		August 17, 2004	530	25	20			
		August 21, 2004	535	25	15			

2. TSS MEASUREMENTS

On a weekly basis, TSS samples were taken from the Final Discharge Point (designated under MMER). The samples were analyzed by ALS Laboratories in Vancouver. The samples were submitted along with the routine weekly and monthly sampling required under the MMER requirements.

On July 6th, 2004 the TSS results exceeded permit and MMER criteria. This was reported to Environment Canada. At the same time as the TSS sample was collected, samples were also collected for Total Metals and Acute Toxicity. The results indicated that the TSS was not caused by mobilization of tailings but rather from erosion of the creek channel. All metals concentrations in the water were compliant with the Water Licence and MMER criteria. Additionally, the Acute Toxicity testing for Rainbow Trout and Daphnia magna show there was no acute toxicity. All other TSS sampling events during the discharge season were compliant with the Water Licence and the MMER.

TSS MONITORING OF GARROW CREEK

At Station 12

Date	TSS	ALS Sample #
6-Jul-08	117	U5572
13-Jul-04	5.7	U5829
20-Jul-04	<3.0	U6161
27-Jul-04	<3.0	U6382
3-Aug-24	3.3	U6832
10-Aug-24	3	U6897
17-Aug-04	5.3	U7327
24-Aug-04	4.4	U7610
31-Aug-04	14.5	U7699
3-Sep-04	3.3	U8363
7-Sep-04	9.7	U7985

3. PHOTOGRAPHIC RECORD DURING DISCHARGE SEASON

The following photographs were generally taken from the same locations each time to provide a record of flow and creek channel changes that occurred over time during the 2004 discharge period. The requirement was to do this on a weekly basis but this was done on a more frequent basis through July when the flow was at its highest. It is evident from the photographs that some erosion of the channel occurred during the peak flows. The dam was decommissioned prior to spring melt and more water than anticipated was initially released as the ice on the lake and in the channel melted.

July 5 2004

July 6 2004

July 7 2004

July 8 2004

July 9 2004

July 10 2004

July 11 2004

July 12 2004

July 14 2004

July 15 2004

July 20 2004

July 25 2004

July 26 2004

July 30 2004

Aug 3 2004

Aug 10 2004

Aug 17 2004

4. PHOTOGRAPHIC RECORD OF CREEK CHANNEL NEAR END OF DISCHARGE SEASON

The monitoring program also included the requirement to take a series of photographs along the complete length of Garrow Creek channel once flow for the season had been concluded. Due to weather conditions, the channel would have been under snow before all water had ceased flowing so the photography was done near the end of July when flow was low and before snow covered the landscape. A series of survey markers were set up every 100 metres along the length of the channel starting at Garrow Lake outflow origin through to where the creek discharges into the ocean. The following photographs are identified by the distance from the origin of the creek flow.

GARROW CREEK

PHOTOGRAPHIC RECORD OF
CONDITIONS ALONG THE ENTIRE
LENGTH OF CREEK JULY 26, 2004

NEAR THE END OF DISCHARGE SEASON

STATION 0 +00

STATION 0 +100

STATION 0 +200

STATION 0 +300

STATION 0 +400

STATION 0 +500

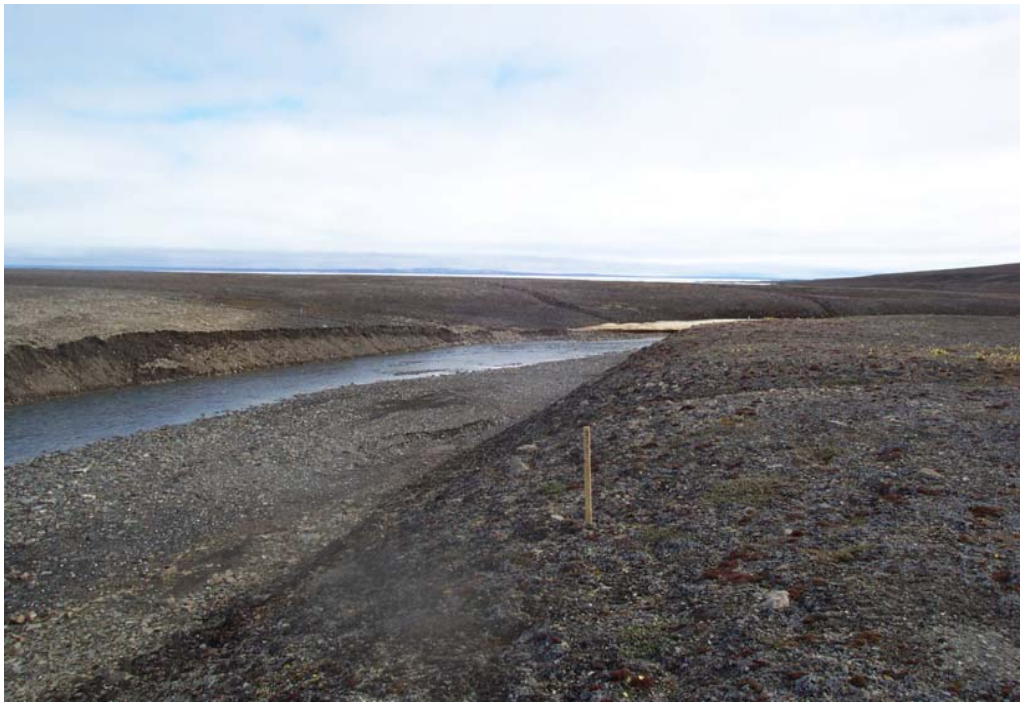
STATION 0 +600

STATION 0 +700

STATION 0 +800

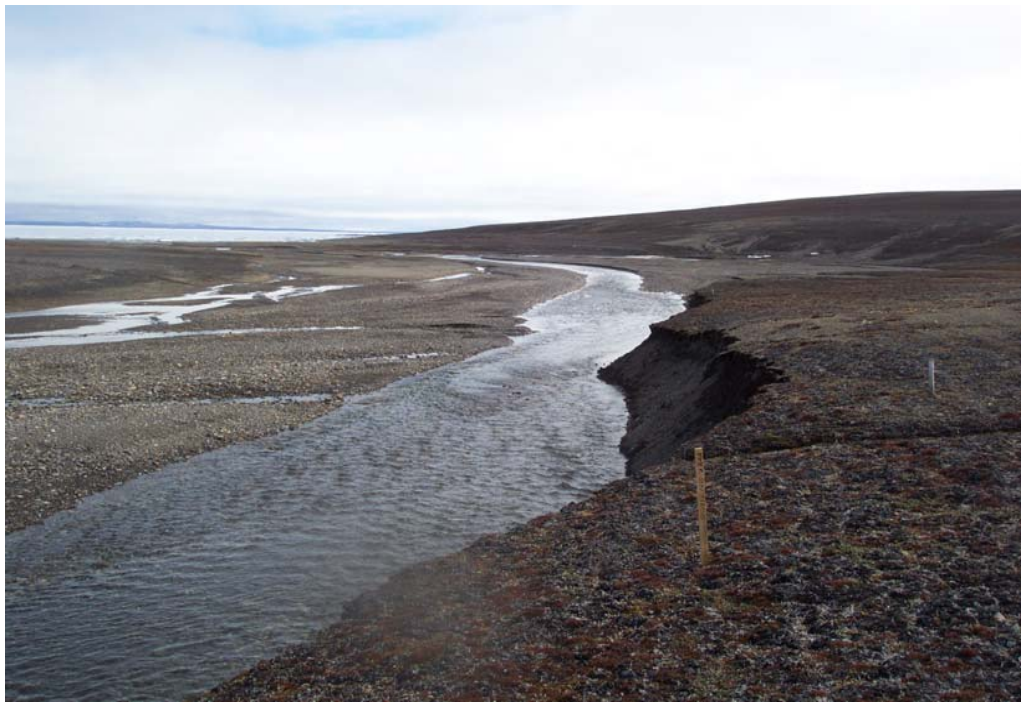
STATION 0 +900

STATION 0 +1000



STATION 0 +1100

STATION 0 +1200



STATION 0 +1300

STATION 0 +1400

STATION 0 +1500

STATION 0 +1600

STATION 0 +1700

STATION 0 +1800

APPENDIX 15

MARINE SHORELINE MONITORING

2004 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

Station 600N is a background location. Acceptable maximum TSS is 25mg/L over background.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Comments
600N	6/19/2004		na	SE150	12	Ice at shoreline
800N	6/19/2004	10.4	14.6	SE150	12	
1000N	6/19/2004		na	SE150	12	Ice at shoreline
1200N	6/19/2004		na	SE150	12	Ice at shoreline
1400N	6/19/2004	30	23.7	SE150	12	Excavation of cell 2/3 berm
1425N	6/19/2004	16.3	9.5	SE150	12	
1600N	6/19/2004	67.7	38.7	SE150	12	TSS greater than 30 mg/L therefore sedimentation control implemented
1600N QA/QC	6/19/2004	66.6	31.0	SE150	12	
1800N	6/19/2004		na	SE150	12	Ice at shoreline
600N	6/20/2004		na	SE120	20	Ice at shoreline
800N	6/20/2004	17.8	19.9	SE120	20	
1000N	6/20/2004		na	SE120	20	Ice at shoreline
1200N	6/20/2004		na	SE120	20	Ice at shoreline
1400N	6/20/2004	22	28.7	SE120	20	Excavation of cell 2/3 berm
1400 QA/QC	6/20/2004	18.6	26.3	SE120	20	
1425N	6/20/2004	22.8	15.9	SE120	20	
1600N	6/20/2004	22.1	24.6	SE120	20	Silt fence in trench directing surface water from lower firehall area to shore
1800N	6/20/2004		na	SE120	20	Ice at shoreline
600N	6/21/2004		na	SE	19	Ice at shoreline
800N	6/21/2004		15.7	SE	19	
800N QA/QC	6/21/2004		16.0	SE	19	
1000N	6/21/2004		na	SE	19	Ice at shoreline
1200N	6/21/2004		na	SE	19	Ice at shoreline
1400N	6/21/2004		23.0	SE	19	Excavation of cell 2/3 berm
1425N	6/21/2004		37.3	SE	19	TSS greater than 30 mg/L therefore sedimentation control implemented
1600N	6/21/2004	12.7	19.9	SE	19	Silt fence in trench directing surface water from lower firehall area to shore
1800N	6/21/2004		na	SE	19	Ice at shoreline
600N	6/22/2004		na	SE145	11	Ice at shoreline
800N	6/22/2004	23	16.2	SE145	11	
1000N	6/22/2004		na	SE145	11	Ice at shoreline
1200N	6/22/2004		na	SE145	11	Ice at shoreline
1400N	6/22/2004	32.9	34.1	SE145	11	Excavation of cell 2/3 berm - geotextile on float booms in place around excavation
1425N	6/22/2004	43.7	69.1	SE145	11	
1425N QA/QC	6/22/2004	15.3	62.6	SE145	11	
1600N	6/22/2004	13.5	67.3	SE145	11	Silt fence in trench directing surface water from lower firehall area to shore. Sample contained a "critter".
1800N	6/22/2004		na	SE145	11	Ice at shoreline

2004 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

Station 600N is a background location. Acceptable maximum TSS is 25mg/L over background.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Comments
600N	6/23/2004			S 180	22	Ice at shoreline
800N	6/23/2004	17	14.1	S 180	22	
1000N	6/23/2004		na	S 180	22	Ice at shoreline
1200N	6/23/2004		na	S 180	22	Ice at shoreline
1400N	6/23/2004	24.9	25.2	S 180	22	Excavation within 30m of shoreline at 1400N. Excavation in former cell 1 area with geotextile on float booms inplace around excavation
1425N	6/23/2004	7.15	7.5	S 180	22	
1425N QA/QC	6/23/2004	8.17	7.5	S 180	22	
1600N	6/23/2004	11.5	6.2	S 180	22	
1800N	6/23/2004		na	S 180	22	Ice at shoreline
600N	6/24/2004			W 270	10	Ice at shoreline
800N	6/24/2004	70.2	56.2	W 270	10	
1000N	6/24/2004		na	W 270	10	Ice at shoreline
1200N	6/24/2004		na	W 270	10	Ice at shoreline
1400N	6/24/2004	7.11	6.6	W 270	10	Excavation in former cell 1 area with geotextile on float booms inplace around excavation.
1425N	6/24/2004	8.83	8.9	W 270	10	
1600N	6/24/2004	19.4	20.3	W 270	10	
1600N QA/QC	6/24/2004	15.4	19.3	W 270	10	
1800N	6/24/2004		na	W 270	10	Ice at shoreline
600N	6/25/2004		na	E85	10	Ice at shoreline
800N	6/25/2004	20.6	23.9	E85	10	
800N QA/QC	6/25/2004	18.1	20.8	E85	10	
1000N	6/25/2004		na	E85	10	Ice at shoreline
1200N	6/25/2004		na	E85	10	Ice at shoreline
1400N	6/25/2004	7.71	7.7	E85	10	Excavation in former cell 1 area with geotextile on float booms inplace around excavation.
1425N	6/25/2004	7.29	6.1	E85	10	
1600N	6/25/2004	8.85	6.1	E85	10	
1800N	6/25/2004		na	E85	10	Ice at shoreline
600N	6/27/2004		na	North	10	Ice at shoreline
800N	6/27/2004	na	15.5	North	10	
800N QA/QC	6/27/2004		3.5	North	10	
1000N	6/27/2004		na	North	10	Ice at shoreline
1200N	6/27/2004		na	North	10	Ice at shoreline
1400N	6/27/2004	na	4.4	North	10	
1425N	6/27/2004	na	6.2	North	10	
1600N	6/27/2004	na	36.3	North	10	Fixed silt fence at 5:30 pm
1800N	6/27/2004		na	North	10	Ice at shoreline

2004 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

Station 600N is a background location. Acceptable maximum TSS is 25mg/L over background.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Comments
600N	6/28/2004		na	West	5	Ice at shoreline
800N	6/28/2004	na	5.5	West	5	
1000N	6/28/2004	na	2.6	West	5	
1200N	6/28/2004		na	West	5	Ice at shoreline
1400N	6/28/2004	na	3.1	West	5	
1425N	6/28/2004	na	5.9	West	5	
1600N	6/28/2004	na	9.0	West	5	
1600N QA/QC	6/28/2004	na	12.2	West	5	
1800N	6/28/2004		na	West	5	Ice at shoreline
600N	6/29/2004	na	4.0	South	15	
600N QA/QC	6/29/2004	na	1.2	South	15	
800N	6/29/2004	na	8.0	South	15	
1000N	6/29/2004	na	7.8	South	15	
1200N	6/29/2004	na	4.9	South	15	
1400N	6/29/2004	na	2.2	South	15	
1425N	6/29/2004	na	4.7	South	15	
1600N	6/29/2004	na	3.5	South	15	
1800N	6/29/2004	na	4.0	South	15	
600N	6/30/2004	na	2.9	South	15	
800N	6/30/2004	na	5.9	South	15	
1000N	6/30/2004	na	4.0	South	15	
1200N	6/30/2004	na	4.0	South	15	
1400N	6/30/2004	na	5.6	South	15	
1425N	6/30/2004	na	6.8	South	15	
1600N	6/30/2004	na	3.5	South	15	
1800N	6/30/2004	na	3.0	South	15	
1800N QA/QC	6/30/2004	na	2.3	South	15	
600N	7/1/2004	na	8.0	NE	20	
600N QA/QC	7/1/2004	na	6.4	NE	20	
800N	7/1/2004	na	4.8	NE	20	
1000N	7/1/2004	na	7.0	NE	20	
1200N	7/1/2004	na	7.6	NE	20	
1400N	7/1/2004	na	11.1	NE	20	
1425N	7/1/2004	na	10.0	NE	20	
1600N	7/1/2004	na	7.7	NE	20	
1800N	7/1/2004	na	13.4	NE	20	

2004 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

Station 600N is a background location. Acceptable maximum TSS is 25mg/L over background.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Comments
600N	7/2/2004	na	3.5	SW	5	
800N	7/2/2004	na	3.2	SW	5	
1000N	7/2/2004	na	2.8	SW	5	
1200N	7/2/2004	na	4.4	SW	5	
1400N	7/2/2004	na	6.4	SW	5	
1425N	7/2/2004	na	7.6	SW	5	
1600N	7/2/2004	na	8.7	SW	5	
1800N	7/2/2004	na	5.2	SW	5	
1800N QA/QC	7/2/2004	na	4.5	SW	5	
600N	7/3/2004	na	2.0	North	8	
600N QA/QC	7/3/2004	na	1.8	North	8	
800N	7/3/2004	na	2.2	North	8	
1000N	7/3/2004	na	3.5	North	8	
1200N	7/3/2004	na	3.4	North	8	
1400N	7/3/2004	na	3.2	North	8	
1425N	7/3/2004	na	5.3	North	8	
1600N	7/3/2004	na	5.3	North	8	
1800N	7/3/2004	na	0.7	North	8	
600N	7/4/2004	na	2.2	NE	10	
600N QA/QC	7/4/2004	na	2.2	NE	10	
800N	7/4/2004	na	3.7	NE	10	
1000N	7/4/2004	na	3.1	NE	10	
1200N	7/4/2004	na	3.7	NE	10	
1400N	7/4/2004	na	5.6	NE	10	
1425N	7/4/2004	na	10.2	NE	10	
1600N	7/4/2004	na	4.9	NE	10	
1800N	7/4/2004	na	1.6	NE	10	
600N	7/5/2004	na	1.4	SW	12	
800N	7/5/2004	na	2.7	SW	12	
1000N	7/5/2004	na	2.6	SW	12	
1200N	7/5/2004	na	2.4	SW	12	
1400N	7/5/2004	na	4.4	SW	12	
1425N	7/5/2004	na	9.3	SW	12	
1600N	7/5/2004	na	11.2	SW	12	
1800N	7/5/2004	na	1.7	SW	12	
1800N QA/QC	7/5/2004	na	1.7	SW	12	

2004 POLARIS TSS DATA - DOCK AND ADJACENT FORESHORE AREA

Station 600N is a background location. Acceptable maximum TSS is 25mg/L over background.

Station	Date (dd/mm/yyyy)	Turbidity (NTU)	TSS (mg/L)	Wind Direction	Wind Velocity (mph)	Comments
600N	7/6/2004	na	2.1			
600N QA/QC	7/6/2004	na	2.4			
800N	7/6/2004	na	3.9			
1000N	7/6/2004	na	7.3			
1200N	7/6/2004	na	6.4			
1400N	7/6/2004	na	5.6			
1425N	7/6/2004	na	8.2			
1600N	7/6/2004	na	10.7			
1800N	7/6/2004	na	7.7			

Marine Shoreline Photographs
June 19, 2004

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

Station 1425N

Station 1600N

Station 1800N

Marine Shoreline Photographs
June 24, 2004

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

Station 1425N

Station 1600N

Station 1800N

Marine Shoreline Photographs
July 1, 2004

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

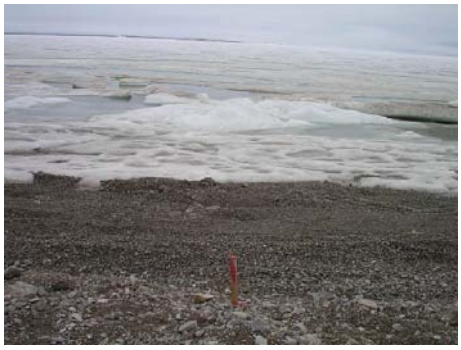
Station 1425N

Station 1600N

Station 1800N

Marine Shoreline Photographs
July 6, 2004

Station 600N



Station 800N

Station 1000N

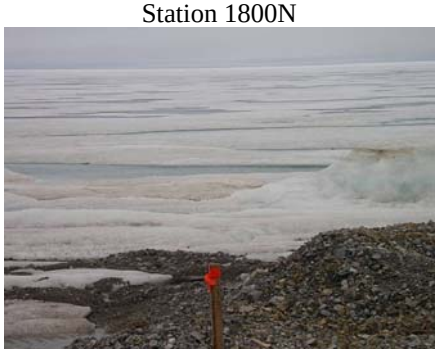
Station 1200N

Station 1400N

Station 1425N

Station 1600N

Station 1800N



Marine Shoreline Photographs
July 12, 2004

Station 600N

Station 800N

Station 1000N

Station 1200N

Station 1400N

Station 1425N

Station 1600N

Station 1800N

APPENDIX 16

INTERTIDAL and SUBTIDAL PHOTOGRAPHIC SURVEY

FORMER DOCK AREA

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC
Canada V6K 2G8

Phone: 604-730-1220
Fax: 604-739-8511

Our File #: TC-03-03

September 27, 2004

Bruce Donald
Teck Cominco Metals
Bag 2000
Kimberley BC V1A 3E1

Dear Mr. Donald:

Re: Intertidal and Subtidal Photographic Survey – Former Dock Area, Polaris Mine

Intertidal Survey – The intertidal beach was visually surveyed during mid-August 2004 and representative photographs taken (Appendix A). There is no evidence of the former dock structure or other infrastructure (concentrate storage shed, machine shops, barge and concentrator). Shorelines have been graded using native cobble and gravel to match the undisturbed intertidal and beach habitat north and south of the former dock. There are no fine sediments (silt/clay) or erosional areas that might contribute sediment to the water column during wind events or ice movement. This area is actively scoured by ice and we observed both ice-free conditions as well as conditions when ice was pushed against the shore. The shoreline withstood and was modified by the ice in the same fashion as shorelines away from the former dock area. Given the coarse grain size of the material and consistent slope and aspect of the remediated beach with the adjacent intertidal shoreline and beach area, we do not expect that the integrity of the remediated area would be compromised in any way.

Subtidal Survey – A Seabed Imagery and Mapping System (SIMS) towed underwater video camera was deployed on August 19, 2004 to record video imagery of the decommissioned dock or wharf area at the Teck Cominco Polaris Mine, Little Cornwallis Island. The objective of the underwater video survey was to document subtidal, marine conditions of the dock area as it relates to fish habitat, in accordance with Section 2.2.3 of the Fisheries and Oceans Canada Fish Habitat Authorization No. 02-HCAA-000-000063. Still photographs (Appendix A) were also taken of the intertidal, foreshore region in the immediate vicinity of the dock to illustrate post-remediation conditions, to compare the former dock area with “native” shoreline north and south of the remediated beach.

This report describes the SIMS imagery depicted on the two DVD videos that accompany this letter and a third DVD depicting subtidal biota from a SCUBA survey.

Figure 1 depicts the location of the former dock cells and shows the SIMS survey tracks relative to the former cells. This figure illustrates the extent of video coverage over the bottom in the vicinity of the former dock, the shoreline north and south of the former dock, and offshore. Video coverage was extended well beyond the former dock to provide sufficient spatial coverage to put the subtidal marine environment near the former dock area in perspective with adjacent habitat.

Five underwater video transects were run in a north – south direction from 200 m to < 20 m offshore up to 300 m north and south of the former dock area. Three more transect were run east – west, perpendicular to shore, over the former dock area to illustrate the transition between subtidal and intertidal habitat. The first three, most offshore transects are depicted on DVD 1. The two innermost transects (four and five) and the perpendicular transects (six to eight) are depicted on DVD 2.

Transect 1 runs south to north, parallel to the shoreline a distance of approximately 200 m offshore of the former shoreline of the dock cells at a depth 30 – 32 m. (Note that the depth transducer did not function properly during the first half of the transect and depth read about 10 m, not 30 m). The seabed is gradually rolling and substrate consists primarily of gravelly sand and shell hash with sporadic rocky outcroppings. There are small reef-like structures that provide abundant habitat complexity and surface area for attached red and brown algae, soft corals, hard corals and corraline algae. Percent cover by biota was at least 80 – 90% in most areas. The hard substrate is also excellent habitat for many macrofauna species such as sea urchin, anemone, crinoids, barnacles and clams (based on abundant shell hash).

Moving northwards, there is a gradual transition to more heterogeneous habitat types consisting of sand dominated areas with scattered cobble and occasional boulder patches (75^{o} 23’ 1649 N 96^{o} 56’ 2581”; Time 3:06) with a return to patchy rocky gravelly sand substrate type (75^{o} 23’ 1758 N 96^{o} 56’ 8703”; Time 4:05). Sand substrates have a lower percent cover by biota (15 – 20%) that consists of anemone, barnacles, clams, crinoids and urchins. It is unusual to see barnacles at the depth recoded here, but may be characteristic of this area. Some anthropogenic debris was also observed, consisting of pieces of wood and metal.

Opposite the former dock area there is a transition to a flat, rough, complex cobble bottom (75^{o} 23’ 2304 N 96^{o} 56’ 0364”; Time 8:15) with a few sand patches. Barnacles and red and brown algae species are attached to the hard bottom. The SIMS survey turned to head back on a southern transect (75^{o} 23’ 3910 N 96^{o} 57’ 3279”; Time 20:00) about 250 m north of the former dock area along Transect 2. At this point the bottom had a uniform, flat slope with coarse gravel, cobble, sand mixture with near complete coverage by algae, barnacles, soft coral and numerous anemone and sea stars.

Transect 2 was conducted from north to south about 125 m offshore at a depth of approximately 19 – 20 m. We attempted to follow this depth contour as much as possible, although several floating icebergs forced the boat to move inshore or offshore to avoid the bergs as necessary (Figure 1). The seabed is relatively flat with uniform coarse cobble/gravel substrate with a few large rocky outcrops. Cover by attached biota is high (70 – 90%) with algae, barnacles, anemone and coralline algae. Abundant shell hash suggests that clams are present in the sediment. Sea stars and anemone are also observed in addition to live sea urchin and abundant sea urchin tests (urchin shell debris).

At 75° 23' 3657 N 96° 57' 1822" (Time 22:42) there was a transition to sandy/silty hummocks and ridges with about 15% rocky/boulder cover habitat. Coarse material (cobble, gravel) is accumulated within the troughs between the sandy ridges, suggesting that the sediment is actively disturbed, probably by propeller action by ships, as this is directly offshore of the former dock. There is less cover by algae, coral and barnacles in these areas and fewer macrofauna.

South of this area moving along the former dock area, substrate and habitat are very mixed alternating between complex, heterogeneous coarse substrate with abundant coverage by algae and macrofauna, to sandy substrates with patches of coarse material, sparse algal coverage and few macrofauna species, except sea urchins (e.g., 75° 23' 3546 N 96° 57' 1407"; Time 22:20). At 75° 23' 3344 N 96° 57' 0724" (Time 24:20) there is a 50 m long sandy ridge about 2 m in height that runs parallel to shore. Troughs contain coarse rock and some debris. This ridge was probably created by ship propeller activity.

Opposite the former dock area, the shoreline naturally becomes shallower, as depth diminishes to about 12 – 15 m at the same distance offshore. At this depth, ambient light conditions are sufficient to support relatively abundant kelp (*Laminaria* sp.) growth over coarse bottom substrates. Sea stars, urchins, anemone, soft coral and some barnacles are also present at these depths, especially in the vicinity of kelp.

Kelp forests provide abundant cover for large, patchy clouds of mysids (*Mysis* sp.) (e.g., (75° 23' 3003 N 96° 57' 2765"; Time 27:40). Mysids and possibly amphipods inhabit spaces among the kelp fronds and were very abundant when present. The relationship between kelp and mysids was also observed from Garrow Bay in 2003 during SCUBA surveys offshore of the mouth of Garrow Creek. A good example of this can be seen on Transect 2 and 3 at 75° 23' 2857 N 96° 56' 9420" (Time 28:21). The bottom consists of a heterogeneous mixture of cobble, gravel and sand with some filamentous red and brown algae, and attached kelp with (30 – 40% cover). Dense clouds of mysids are present within 1 m off of the bottom and concentrated near cover. A sea cucumber was observed, as well as a single fish, possibly an Arctic cod.

Offshore of the former dock area the bottom is distinctly furrowed (75° 23' 2618 N 96° 56' 8944"; Time 29:35) with a mostly sandy bottom (depth 15 m) with scattered cobble, gravel and a few rocks. Cover by biota is only 10%. South of this area there is a transition back to rocky troughs with cobble substrate (75° 23' 2293 N 96° 56' 8095"; Time 31:17) and large, rocky piles of broken rock and cobble and occasional sandy patches with some attached algae and kelp. Mysids, sea stars and anemone are present. Further south, the bottom is flatter, less disturbed and kelp and algal coverage increases as does mysid abundance. At the south end of Transect 2 (11 m depth), there is a transition to soft, sandy/silt bottom with uniform slope and a few drop-offs and ledges with few attached biota such as kelp or anemone. Sea urchins are abundant over the bottom, which may partly explain the lack of kelp.

Transect 3 (75° 23' 1184 N 96° 56' 4447"; Time 37:19) was conducted in a south – north direction in 7 – 13 m of water between 40 m and 80 m offshore, depending on ice conditions. Habitat at the southern end of the transect consists of very coarse, rocky, heterogeneous substrate with a variable, steep slope with kelp cover of about 60%. Mysids are abundant with few anemone and no sea urchins or sea stars observed. Northwards, there is a gradual transition to finer substrates in deeper water becoming more sandy/silty with 20% algae cover, less kelp and few anemone and mysids. Transect 3 overlapped transect 2 at 75° 23'

2490 N 96° 56' 8393"; Time 49:25 (Figure 1) because a small iceberg occurred in the same area as the abundant mysid clouds observed on Transect 2.

Progressing northwards, depth and substrate type varied in much the same fashion as Transect 2, partly because of the spatial overlap and because of the influence of proximity to the former dock area. Nearer the dock area, substrate is more disturbed and contains hummocks and depressions with a mixture of substrate. Sea urchins are common over sandy substrate. Where substrate consists of rock, cobble and gravel, attached biota such as algae and kelp are more abundant as are sea anemone, soft corals, barnacles and sea stars. A good example is at 75° 23' 1645 N 96° 56' 5923" (Time 41:00) (8.6 m), where bottom substrate steeply slopes and consists of coarse rock with abundant attached biota.

There is a gradual transition to sandy/silty substrate and less complex habitat at about 75° 23' 2405 N 96° 56' 8294" (Time 47:40). Biota coverage is sparse with occasional clumps of attached algae and kelp, and relatively flat bottom with small waveforms in the sand. There are patches of abundant kelp cover, however, that support dense clouds of mysids at about 15 m depth. This habitat extends north to 75° 23' 3536 N 96° 57' 0705"; Time 55:00 (15.5 m depth) where there is an abrupt transition to a flat bottom consisting mostly of sand with some gravel/cobble and abundant scattered shell debris and sea anemone, with sparse cover by algae or kelp. Transect 3 ends over a wide slow turn west towards deeper water (18 m) with moderate cover by algae and kelp and very abundant cover and diversity by macrofauna, especially sea anemone.

Transect 4 (DVD 2, Tape 4) runs north – south between 40 and 60 m offshore of the remediated beach in water depths between 8 and 9 m 75° 23' 4048 N 96° 57' 0939"; Time 02:50). The seabed is relatively flat with sandy/silty substrate with occasional boulders, lots of sea urchins and some kelp and coralline algae. Moving south, kelp abundance increases as does density of mysids. At 75° 23' 3724 N 96° 57' 0107" (Time 03:40) there is abundant kelp cover and mysid abundance over the bottom with some sediment accumulation over bottom substrate and on kelp fronds, presumably as a result of remedial activities around the dock cells.

Transect 4 runs along shore parallel to the bottom beneath the steep slope north and south of the approaches to the dock cells (75° 23' 3062 N 96° 56' 9070"; Time 06:04) and at shallow depths within the former dock cells. Directly offshore of the north end of the former dock, slope is very steep and consists of large rock and boulder substrate with abundant kelp cover. Depth increases sharply to 3 m and the video survey continues within the former dock cell (Time 06:56). Substrate consists of sandy/silt with clean patches of gravel/cobble. Walls of the cut off cells are clearly visible, with some sections partially buried by sediment. At this part of Transect 4, the SIMS camera moves inside and outside of the semi-circular cells during the along-shore transit.

At 75° 23' 2416 N 96° 56' 7802" (Time 08:33) the camera drops outside of the south end of the former dock over the steep wall surrounding the cells into deeper water (8 m). Beyond 3 m depth, beneath the ice-scour zone, sediment grain size increases as does cover by biota. South of the former dock, the transect was forced nearer shore by an ice floe and depth diminished to 2 m before a transition to deeper water (75° 23' 1551 N 96° 56' 5150"; Time 12:22) with steep slope, coarse substrate and 70% kelp cover with some mysids and anemone. About 100 m south of the former dock, the SIMS survey turns to continue northwards on Transect 5, only 20 m or less from shore in 1 – 3 m of water (75° 23' 1215 N 96° 56' 3972"; Time 14:00).

Transect 5 is conducted along shore in very shallow (< 2 m) water parallel to and no more than 25 m offshore. Substrate south of the dock cells consists of a heterogeneous mixture of coarse materials dominated by ice-scoured cobble/gravel with a few boulders and no algae or other macrofauna. Some metal and other anthropogenic debris can be seen. Abundant large substrate surrounding the former dock cells prevents any substantive erosion of the shoreline surrounding the cells. Within the cut-off sheet pile walls of the former dock cells, bottom sediment is fine grain, consisting primarily of sandy/silt with occasional gravel patches. The substrate is slightly winnowed by surface waves and does not appear to be actively eroding or contributing sediment to the water column. Depending on ice conditions, this area may be modified by shifting floes of ice pushed ashore by wind-driven currents. However, like the remaining shoreline at this shallow depth, this habitat will not support biota. North of the former dock area (75° 23' 2971N 96° 56' 8512"; Time 22:40), bottom substrate is naturally very coarse and similar to substrate south of the former dock with no attached biota. Transect 5 ends at 26:00. At this point, the SIMS survey was re-located (75° 23' 2198 N 96° 56' 8978"; Time 28:18) to conduct three transects (6, 7 and 8) perpendicular to shore, alternatively moving from deep water (~28 m; again the depth transducer was not functioning properly), onshore and offshore (Figure 1).

Transect 6 moves onshore directly towards the south end of the former dock. Here the bottom consisted of a mixture of rock, cobble and gravel with sparse algae cover with some barnacles and anemone. About 100 m offshore, deep furrows and hummocks are clearly seen on the bottom, due to propeller action (e.g., 75° 23' 2377 N 96° 56' 8333"; Time 29:53). At 50 m offshore, the SIMS survey encountered the vertical face of the dock cell sheet pile that is heavily encrusted with kelp, algae and anemone. Within the dock cell, at a depth of about 3 m, substrate is similar as described on Transect 5 and consists of sandy/silt with gravel patches.

At 75° 23' 2672 N 96° 56' 8083" (Time 32:30) the survey turned north and then offshore (west along **Transect 7**) immediately dropping to 8 m off the west side of the sheet pile. Substrate consists of scattered rock, cobble, and gravel and shell debris. Some anthropogenic material such as metal is observed. With increasing depth, abundance of biota, such as anemone, barnacle, crinoids, sea cucumber and especially mysids increases.

The final onshore **Transect 8** was made at 35:20 towards the north end of the former dock. Similar slope and habitat features (i.e., furrows, substrate, biota) were observed. At 75° 23' 2755 N 96° 56' 8558" (Time 38:34) the SIMS camera approached and moved up the joint between two dock cell walls and moved inside the dock (Figure 1). The survey then turned away from the shore and followed the shoreline south towards the south end of the former dock (75° 23' 2666 N 96° 56'8342"; Time 40:09). The cut off edges of the sheet piles can clearly be seen, demarking the boundary between substrates within and filling the dock cells, from the sheet pile walls and coarse substrates on the outside (west) of the former dock. Note that a small school of juvenile Arctic cod was observed at 40:45, using the inside of the cells as cover.

The SIMS survey on DVD 2 ended at the south end of the former dock at 75° 23' 2420 N 96° 56' 7477" (Time 42:34).

SCUBA Dive Video

In addition to the SIMS towed underwater video imagery, the SCUBA team filmed a single onshore transect beginning approximately 100 m offshore in 23 m of water towards the dock cells, focusing on macrofauna species. Many more species are clearly observed from the SCUBA survey video because of the attention to detail that cannot be achieved with SIMS.

Imagery of the SCUBA video begins directly offshore of the dock within the disturbed, furrowed habitat that consists of a mixture of substrate (cobble, gravel, sand, silt), shell debris, anthropogenic debris and attached macrofauna. Abundant species include urchins, anemone, barnacles, and soft coral and coralline algae.

There is reasonably abundant hard substrate that supports good abundance and diversity of macrofauna. Notable macrofauna filmed by the camera crew include the following organisms:

- A large basket star (02:04).
- Soft coral and nudibranch (3:03).
- Nudibranch and coralline algae with barnacles feeding in the background (18 m depth).
- Shrimp and northern red anemone (4:15).
- Sea star vs. sea star (4:43).
- Sea spider (Pycnogonidia) and softshell clams (5:15).
- Hummock and trench habitat (7:40) with abundant red algae, kelp and mysids (8:20); nudibranch and barnacles.

At 11:00, 10 – 20 m offshore of the dock cells in 8 – 10 m of water bottom is flat with sandy/silt substrate, sparse algal coverage and relatively abundant mysid population. The vertical wall of the dock cell is encountered at 12:40 and appears to support an abundant and diverse invertebrate community. There is excellent coverage by red and brown algae, kelp, barnacles and tunicates.

Inside the former dock cells, substrate consists of sandy/silt with gravel patches. Mysids can be observed within the dock cells. The video acquired using SCUBA substantiates and supports the SIMS survey and provides additional, fine-scale imagery of resident biota.

Summary

Subtidal Survey – The SIMS survey was conducted along a series of transects, parallel and perpendicular to shore, extending directly north/south and east/west of the remediated dock and adjacent habitat.

Subtidal marine habitat surrounding the former dock area is heterogeneous, consisting primarily of coarse substrate dominated by cobble/gravel with occasional boulders, interspersed by smaller grain-size sandy/silt patches. Bottom slope is gradual and shallow and there is no evidence of extensive disturbance by ice. At deep depths (>18 m), biota consisted of sparse algae cover, barnacles and other macrofauna especially anemone, crinoids and sea cucumber. At depths shallower than 18 m, large blade kelp becomes increasingly abundant and in many locations, supports dense aggregations of mysids and possibly amphipods. Sea anemone, crinoids, sea urchin, barnacles and sea stars are also abundant. In sandy habitats, sea urchins dominate macrofauna taxa. Directly offshore (50 – 75 m) of the former dock, deep (~2 m) furrows and hummocks with a heterogeneous mixture

of sand, cobble and gravel are observed. These furrows are presumably created by the propeller action of more than 20 years of docking by ships in this area. Furrows are not observed at similar distances offshore north and south of the former dock.

Within 20 – 30 m of the former dock cells, the base of which is in 8 – 12 m of water, bottom substrate consists of boulder and rock and slopes steeply upwards to meet the vertical sheet piles. The rocky slope provides excellent habitat for attached biota, especially algae and kelp, which provide abundant cover for other fauna, especially mysids. Amphipods, anemone and a few fish were observed. The sheet piles themselves also provide good habitat for algae and kelp and are heavily encrusted by macrofauna.

Within the dock cells themselves, water depth is about 3 m and bottom substrate consists primarily of fine grain sandy/silt with occasional patches of gravel and cobble. There is no evidence of biota at such shallow depths, which is consistent with habitat north and south of the dock cells because ice-scour prevents colonization by biota. The fine sediments show signs of winnowing from wave action. Remedial activities appear to have dispersed some fine sediment that has settled on habitat around the dock area.

Intertidal Habitat – The intertidal habitat directly onshore of the former dock and north and south of the dock consists of coarse gravel/cobble. Shoreline features in the immediate vicinity of the former dock are indistinguishable from adjacent shorelines and appear stable and non-erosional and will be shaped by ice (see Photos). The coarse material along shore, adjacent to the fine sediments within the dock cells will likely move offshore with ice movements and ice rafting, gradually covering the fine sediments and further eliminating these as a sediment source.

Sincerely,

Azimuth Consulting Group Inc.

Randy Baker, M.Sc., R.P.Bio.

cc:

Legend

Features

- SIMS Route
- Transect Direction
- Former Dockcell
- Former Structures

Details

- Geogrpahic Coordinate System (Lat, Long)
- Polaris Mine Coordinate System
- Coast Line
- 1m Contour Line
- 0.5m Contour Line

300 E
400 E
500 E
600 E
75° 23.4' N
1700 N
1600 N
75° 23.3' N
1500 N
96° 57.25' W
1400 N
75° 23.2' N
1300 N
96° 57.0' W
1200 N
75° 23.1' N
96° 56.75' W
1100 N
96° 56.5' W

Transect 1
Transect 2
Transect 3
Transect 4
Transect 5

Inset 1

C R O Z I E R S T R A I T

0 25 50 100 150 m
Plotted at 1:2500

SHORELINE ELEV. 998.7 m
WEST OF SHORELINE
SURVEYED 19 AUGUST 2004
19:00h – 20:00h

Inset 1

0 10 20 40m
Plotted at 1:1000

Transect 8
Transect 7
Transect 6
End of Survey

PREPARED BY:

AZIMUTH

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver BC, V6K 2G8

DRAWN BY:	CHECK BY:	DATE:	PROJECT No:
BT	RB	10/12/2004 1:30 PM	TC-03-03

PROJECT: Polaris Mine

TITLE:

SIMS Survey
Transect Lines

CLIENT: Teck Cominco

Figure 1

Appendix A – Photo 1: South of former dock cells looking west from hill.

Appendix A – Photo 2: South end of foreshore area of former dock area looking west from hill.

Appendix A – Photo 3: North end of former dock area, looking west from hill.

Appendix A – Photo 4: North of former dock area, looking west from hill.

Appendix A – Photo 5: Foreshore area of south end of former dock showing remediated shoreline.

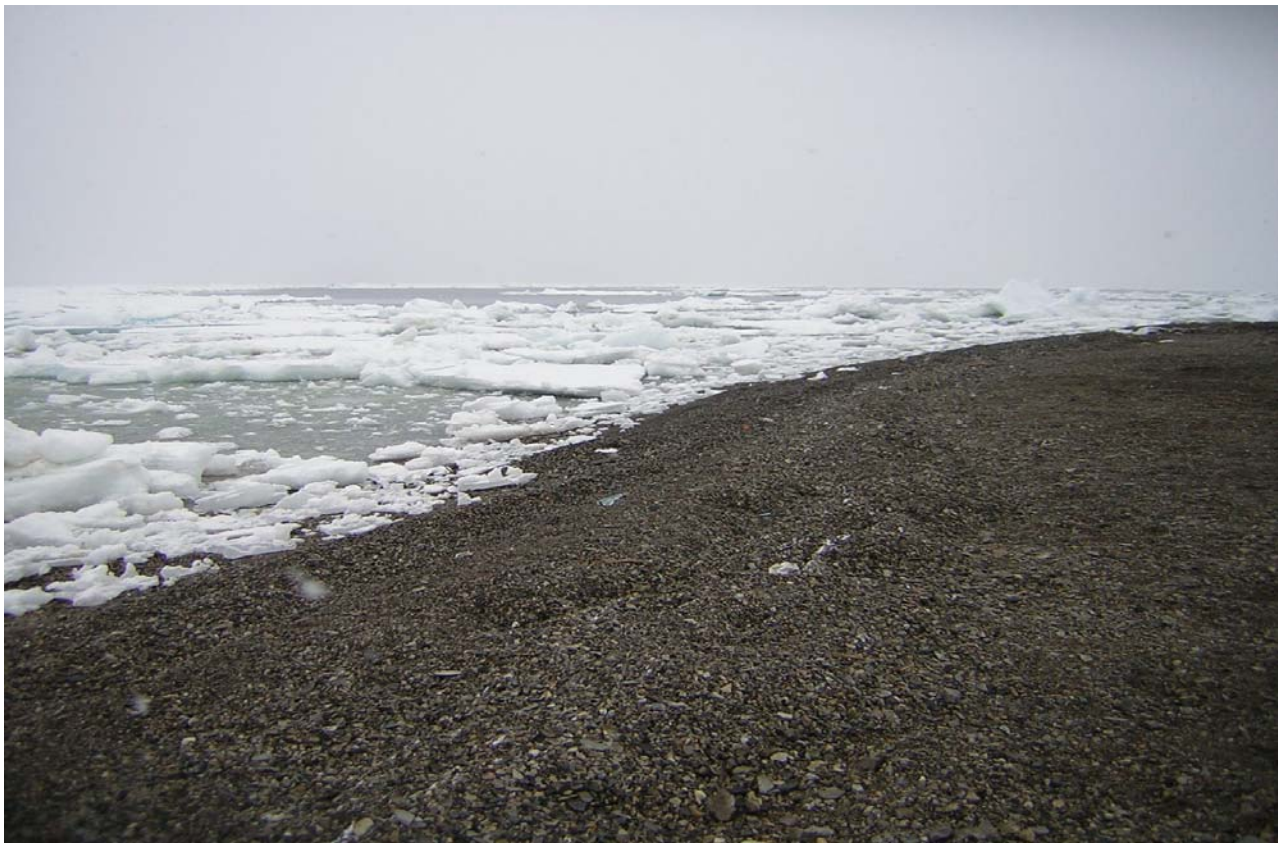
Appendix A – Photo 6: Foreshore area of former dock area, looking north.

Appendix A – Photo 7: Immediate foreshore area of former dock, looking north.

Appendix A – Photo 8: Foreshore of former dock, showing remediated shoreline features and ice cover.

Appendix A – Photo 9: Northern boundary of former dock area foreshore.

Appendix A – Photo 10: Foreshore area just north of former dock showing ice-scoured shoreline.



APPENDIX 17

MISCELLANEOUS WATER AND SOILS SAMPLES

COLLECTED FROM THE SITE

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	October 22, 2004
ALS File No.	U7585
Report On:	TC-03-03 Soil Analysis
Report To:	**Azimuth Consulting Group Inc.** 218 - 2902 West Broadway Vancouver, BC V6K 2G8
Attention:	**Mr. Patrick Allard**
Received:	September 1, 2004

ALS ENVIRONMENTAL
per:

Andre Langlais, M.Sc. - Project Chemist
Frederick Chen, B.Sc. - Section Coordinator

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

A Campbell Brothers Limited Company

File No. U7585

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID				G Lake	G Bay-int
Sample Date				04-08-26	04-08-26
ALS ID				*1*	*2*
Physical Tests					
pH				7.97	
Total Metals					
Antimony	T-Sb			<10	<20
Arsenic	T-As			11.0	<10
Barium	T-Ba			984	711
Beryllium	T-Be			0.59	<1.0
Cadmium	T-Cd			3.01	<1.0
Chromium	T-Cr			18.6	15.1
Cobalt	T-Co			4.7	<4.0
Copper	T-Cu			28.1	15.1
Lead	T-Pb			71	<100
Mercury	T-Hg			0.070	<0.050
Molybdenum	T-Mo			<4.0	<8.0
Nickel	T-Ni			32.2	20
Selenium	T-Se			<2.0	<4.0
Silver	T-Ag			<2.0	<4.0
Tin	T-Sn			<5.0	<10
Vanadium	T-V			59.3	57.2
Zinc	T-Zn			1160	101
Organic Parameters					
Total Organic Carbon		C		4.61	
Particle Size					
Gravel	(>2.00mm)		(%)	<0.10	0.80
Sand	(2.00mm - 0.063mm)		(%)	2.30	48.1
Silt	(0.063mm - 4um)		(%)	71.7	40.1
Clay	(<4um)		(%)	26.0	11.0

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
Total Organic Carbon results are expressed as percent, dry weight basis.

A Campbell Brothers Limited Company

File No. U7585

Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

pH in Soil

This analysis is carried out in accordance with procedures described in "Soil Sampling and Methods of Analysis" (CSSS). The procedure involves mixing the air-dried sample with deionized/distilled water. The pH of the solution is then measured using a standard pH probe. A one to two ratio of sediment to water is used for mineral soils and a one to ten ratio is used for highly organic soils.

Metals in Sediment/Soil

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B or Method 3051, United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by either hotplate or block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic absorption/fluorescence spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

Recommended Holding Time:

Sample:	6 months (Hg = 28 days)
Extract:	6 months (Hg = 28 days, Sb & Sn = 7 days)
Reference:	BCMELP

For more detail see ALS Environmental "Collection & Sampling Guide"

Total Carbon, Total Organic Carbon and Inorganic Carbon in Sediment/Soil

This analysis is carried out in accordance with U.S. EPA Method 9060A (Publ. # SW-846 3rd ed., Washington, DC 20460). Total Carbon is determined by high temperature oxidation of carbon to carbon dioxide which is then measured by means of a nondispersive infrared analyzer. Inorganic Carbon is determined by reaction with phosphoric acid to convert all carbonates to carbon dioxide which is also measured by means of a nondispersive infrared analyzer. Total Organic Carbon is determined as the difference between Total and Inorganic Carbons.

Recommended Holding Time:

A Campbell Brothers Limited Company

Appendix 1 - METHODOLOGY - Continued

Sample: 14 days
Reference: Puget
For more detail see ASL "Collection & Sampling Guide"

Particle Size Distribution in Sediment/Soil

This analysis is carried out using a method adapted for Fisheries and Environment Canada, Ottawa, described in Walton, 1978. The procedure involves oven-drying and sample pre-treatment to remove organics, prior to using standard sieves for the sand and silt fractions and the pipette method for the clay fraction.

Laboratory Location: Pacific Soil Analysis Inc., Richmond (Subcontract)

Results contained within this report relate only to the samples as submitted.

This Chemical Analysis Report shall only be reproduced in full, except with the written approval of ALS Environmental.

End of Report

A Campbell Brothers Limited Company

ALS Environmental

CHEMICAL ANALYSIS REPORT

Date:	September 29, 2004
ALS File No.	U8363
Report On:	Polaris/ TC-03-03 Water Analysis
Report To:	**Azimuth Consulting Group Inc.** 218 - 2902 West Broadway Vancouver, BC V6K 2G8
Attention:	**Mr. Randy Baker**
Received:	September 20, 2004

ALS ENVIRONMENTAL
per:

Leanne Harris, B.Sc. - Project Chemist
Andre Langlais, M.Sc. - Project Chemist

ALS CANADA LTD.
1988 Triumph Street, Vancouver, BC Canada V5L 1K5
Phone: 604-253-4188 Fax: 604-253-6700 Website: www.alsenviro.com

A Campbell Brothers Limited Company

File No. U8363

RESULTS OF ANALYSIS - Water

Sample ID	F-FRUST-TSS-12200
Sample Date	04-09-03
Sample Time	17:00
ALS ID	*1*
Physical Tests	
Total Suspended Solids	3.3

Results are expressed as milligrams per litre except where noted.

A Campbell Brothers Limited Company

File No. U8363

Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

This Chemical Analysis Report shall only be reproduced in full, except with the written approval of ALS Environmental.

End of Report

A Campbell Brothers Limited Company

APPENDIX 18

GARROW LAKE STRATIGRAPHY MONITORING

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 26, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	<0.00020	<0.00020	0.00057	0.000075	0.00117	<0.010	0.00395	0.00903	<0.000010	<0.0050	0.00373	<0.010	0.236
GL Mid- 4m	0.00024	0.00024	0.000492	0.000064	0.000924	<0.010	0.00193	0.00831	-	<0.0050	0.00319	<0.010	0.197
GL Mid- 5m	<0.00020	<0.00020	0.000513	0.000069	0.00119	<0.010	0.00173	0.00833	-	<0.0050	0.00353	<0.010	0.209
GL Mid- 6m	0.00027	<0.00020	0.000591	0.000069	0.00162	0.018	0.0152	0.00858	-	<0.0050	0.00346	<0.010	0.207
GL Mid- 7m	0.00036	0.00029	0.000493	0.000061	0.000976	<0.010	0.000794	0.00819	-	<0.0050	0.00341	<0.010	0.197
GL Mid- 8m	0.00024	<0.00020	0.00048	0.00006	0.000983	<0.010	0.000447	0.00806	-	<0.0050	0.0033	<0.010	0.189
GL Mid- 9m	0.00027	<0.00020	0.00194	0.000098	0.00191	<0.010	0.000667	0.0199	-	<0.0050	0.0064	<0.010	0.702
GL Mid- 10m	0.00051	0.00039	0.00231	0.000265	0.00351	<0.010	0.00151	0.0753	<0.000010	<0.0050	0.0082	<0.010	0.932
GL Mid- 11m	0.00097	0.0004	0.00021	0.000816	0.00177	0.082	0.00246	0.0961	-	0.006	0.00821	<0.010	0.279
GL Mid- 12m	0.00094	0.00055	0.000217	0.000712	0.00315	0.108	0.0071	0.0944	-	0.0072	0.00862	<0.010	0.27
GL Mid- 13m	0.00096	0.0007	0.00021	0.000518	0.00297	0.095	0.0117	0.0827	-	0.0066	0.00826	<0.010	0.251
GL Mid- 14m	0.00105	0.00035	0.000143	0.000452	0.00273	0.104	0.00534	0.0827	-	0.0066	0.00875	<0.010	0.229
GL Mid- 15m	0.00095	0.0008	0.000094	0.00039	0.00165	0.186	0.00347	0.0825	-	0.0068	0.00847	<0.010	0.256
GL Mid- 16m	0.00081	0.00069	0.000082	0.000402	0.00143	0.211	0.00255	0.0857	-	0.0073	0.00896	<0.010	0.265
GL Mid- 17m	0.00092	0.00061	0.000086	0.000403	0.0014	0.214	0.00284	0.0848	-	0.0068	0.00893	<0.010	0.267
GL Mid- 18m	0.00078	0.00074	0.000084	0.000415	0.00151	0.225	0.003	0.086	-	0.0064	0.00922	<0.010	0.275
GL Mid- 19m	0.00084	0.00083	0.0001	0.000387	0.00144	0.217	0.00308	0.0832	-	0.0071	0.00879	<0.010	0.266
GL Mid- 20m	0.00082	0.00086	0.000081	0.000383	0.00151	0.219	0.00308	0.0844	-	0.0063	0.00866	<0.010	0.26
GL Mid- 22m	0.00087	0.00082	0.00009	0.000428	0.00167	0.236	0.0051	0.0881	-	0.0068	0.00968	<0.010	0.26
GL Mid- 30m	0.00024	0.00034	0.000076	0.00035	0.000844	0.333	0.00317	0.0861	-	0.0059	0.00862	<0.010	0.0514
GL Mid- 40m	0.00028	<0.00020	0.000552	0.00008	0.00127	0.014	0.00558	0.00966	-	<0.0050	0.00361	<0.010	0.234

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to Ice can not sample the top 2 metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	<0.00020	0.00026	0.000638	0.000066	0.00112	0.012	0.00318	0.0103	<0.000010	<0.0050	0.00362	<0.010	0.234
GL Mid- 4m	<0.00020	<0.00020	0.000741	0.000073	0.00125	0.026	0.0135	0.0112	-	<0.0050	0.00382	<0.010	0.227
GL Mid- 5m	<0.00020	<0.00020	0.000608	0.000078	0.00102	0.01	0.00144	0.00975	-	<0.0050	0.00378	<0.010	0.247
GL Mid- 6m	<0.00020	<0.00020	0.000617	0.000066	0.00102	<0.010	0.00168	0.00957	-	<0.0050	0.00385	<0.010	0.229
GL Mid- 7m	<0.00020	0.00027	0.0006	0.000064	0.000985	0.039	0.0015	0.00969	-	<0.0050	0.00357	<0.010	0.227
GL Mid- 8m	<0.00020	<0.00020	0.000641	0.000071	0.000969	0.023	0.000926	0.00956	-	<0.0050	0.00363	<0.010	0.231
GL Mid- 9m	<0.00020	0.00028	0.00255	0.000153	0.00225	<0.010	0.0012	0.0209	-	<0.0050	0.00706	<0.010	0.816
GL Mid- 10m	0.00049	0.00039	0.00217	0.000386	0.00329	<0.010	0.00456	0.0898	0.000012	<0.0050	0.00735	<0.010	0.764
GL Mid- 11m	0.00087	0.0005	0.000261	0.00092	0.00163	0.136	0.00481	0.107	-	<0.0050	0.0083	<0.010	0.315
GL Mid- 12m	0.00096	0.00046	0.000207	0.000751	0.00218	0.173	0.00682	0.0971	-	<0.0050	0.00821	<0.010	0.262
GL Mid- 13m	0.00093	0.00044	0.000199	0.000614	0.00248	0.17	0.00861	0.0884	-	0.005	0.00831	<0.010	0.234
GL Mid- 14m	0.00068	0.00072	0.000151	0.00046	0.00193	0.203	0.00645	0.0878	-	0.0062	0.00854	<0.010	0.211
GL Mid- 15m	0.0006	0.00061	0.000078	0.000433	0.0012	0.27	0.00247	0.0903	-	0.0052	0.00914	<0.010	0.211
GL MId- 16m	0.00074	0.0006	0.000079	0.000431	0.0012	0.257	0.00279	0.0876	-	<0.0050	0.00875	<0.010	0.201
GL Mid- 17m	0.00064	0.00065	0.000075	0.000416	0.00127	0.25	0.00338	0.086	-	0.0053	0.00878	<0.010	0.193
GL Mid- 18m	0.0006	0.00059	0.000074	0.000428	0.00113	0.257	0.00269	0.0855	-	0.005	0.00887	<0.010	0.204
GL Mid- 19m	0.00074	0.0006	0.000074	0.000424	0.00113	0.267	0.00241	0.0852	-	<0.0050	0.00897	<0.010	0.202
GL Mid- 20m	0.00067	0.00067	0.000072	0.000415	0.0011	0.252	0.00244	0.0833	-	<0.0050	0.00873	<0.010	0.197
GL Mid- 22m	0.0007	0.00061	0.000081	0.000431	0.00113	0.258	0.00235	0.0862	-	<0.0050	0.00887	<0.010	0.199
GL Mid- 30m	<0.00020	0.00039	0.000082	0.000381	0.00103	0.382	0.00902	0.0841	-	<0.0050	0.00781	<0.010	0.117
GL Mid- 40m	<0.00020	<0.00020	0.000034	0.000129	0.00135	0.486	0.00124	0.0473	-	<0.0050	0.000892	<0.010	0.0301

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m													
GL Mid- 4m													
GL Mid- 5m													
GL Mid- 6m													
GL Mid- 7m													
GL Mid- 8m													
GL Mid- 9m													
GL Mid- 10m													
GL Mid- 11m													
GL Mid- 12m													
GL Mid- 13m													
GL Mid- 14m													
GL Mid- 15m													
GL Mid- 16m													
GL Mid- 17m													
GL Mid- 18m													
GL Mid- 19m													
GL Mid- 20m													
GL Mid- 22m													
GL Mid- 30m													
GL Mid- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3 Continued
MID WINTER SAMPLING EVENT - JANUARY 26, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-	7.2	<3.0	<0.0050
GL Mid- 4m	<0.020	7.4	<3.0	-
GL Mid- 5m	-	7.5	4	-
GL Mid- 6m	-	7.6	4.7	-
GL Mid- 7m	-	7.6	<3.0	-
GL Mid- 8m	<0.020	7.6	<3.0	-
GL Mid- 9m	-	24.4	7.1	-
GL Mid- 10m	-	49.6	4.7	0.0092
GL Mid- 11m	-	61.5	8.7	-
GL Mid- 12m	<0.020	61.8	5.8	-
GL Mid- 13m	-	59.2	18	-
GL Mid- 14m	-	62	20.7	-
GL Mid- 15m	-	62	21.3	-
GL Mid- 16m	<0.020	61.8	18.7	-
GL Mid- 17m	-	61.9	20.8	-
GL Mid- 18m	-	62	24.7	-
GL Mid- 19m	-	61.2	20.7	-
GL Mid- 20m	<0.020	62	26	-
GL Mid- 22m	-	62.2	36	-
GL Mid- 30m	-	62.6	24	-
GL Mid- 40m	0.021	7.3	7.3	-

Footnotes:

1. Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.
2. Data for Density for GL Mid-40m is incorrect for

as this number is physically impossible.

GARROW LAKE - STATION 262-3 Continued
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-	8.1	3	<0.0050
GL Mid- 4m	-	8.2	<3.0	-
GL Mid- 5m	-	8.3	<3.0	-
GL Mid- 6m	-	8.2	6.3	-
GL Mid- 7m	-	8.2	4.3	-
GL Mid- 8m	-	8.1	5.7	-
GL Mid- 9m	-	24.5	9.7	-
GL Mid- 10m	<0.020	55	23	0.0098
GL Mid- 11m	-	62.4	20.3	-
GL Mid- 12m	-	63.1	17.6	-
GL Mid- 13m	-	62.8	25.7	-
GL Mid- 14m	0.03	63.3	5.3	-
GL Mid- 15m	-	63.6	20.3	-
GL Mid- 16m	-	63.7	22.3	-
GL Mid- 17m	0.027	63.8	21.7	-
GL Mid- 18m	-	64.2	19.7	-
GL Mid- 19m	-	64.2	20.3	-
GL Mid- 20m	0.022	63.7	31	-
GL Mid- 22m	-	63.5	38.3	-
GL Mid- 30m	-	63.5	23	-
GL Mid- 40m	0.034	64.1	26.3	-

Footnotes:

Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.

GARROW LAKE - STATION 262-3 Continued
MINIMUM ICE THICKNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m				
GL Mid- 4m				
GL Mid- 5m				
GL Mid- 6m				
GL Mid- 7m				
GL Mid- 8m				
GL Mid- 9m				
GL Mid- 10m				
GL Mid- 11m				
GL Mid- 12m				
GL Mid- 13m				
GL Mid- 14m				
GL Mid- 15m				
GL Mid- 16m				
GL Mid- 17m				
GL Mid- 18m				
GL Mid- 19m				
GL Mid- 20m				
GL Mid- 22m				
GL Mid- 30m				
GL Mid- 40m				

Footnotes:

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 27, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	0.00021	<0.00020	0.000526	0.000077	0.00108	<0.010	0.000943	0.00927	<0.000010	<0.0050	0.00366	<0.010	0.223
GL South- 4m	0.0003	<0.00020	0.000531	0.000068	0.000966	<0.010	0.00232	0.00935	-	<0.0050	0.00358	<0.010	0.211
GL South- 5m	<0.00020	<0.00020	0.000537	0.000074	0.000936	<0.010	0.000361	0.00913	-	<0.0050	0.00367	<0.010	0.223
GL South- 6m	0.00028	<0.00020	0.000518	0.000066	0.000932	<0.010	0.000483	0.00924	-	<0.0050	0.00336	<0.010	0.202
GL South- 7m	0.00025	<0.00020	0.000522	0.000067	0.000916	<0.010	0.000325	0.00906	-	<0.0050	0.00361	<0.010	0.208
GL South- 8m	0.00026	<0.00020	0.000531	0.000075	0.000884	<0.010	0.000414	0.00935	-	<0.0050	0.00375	<0.010	0.223
GL South- 9m	0.00032	<0.00020	0.00267	0.000113	0.00277	<0.010	0.000715	0.0231	-	<0.0050	0.0084	<0.010	1
GL South- 10m	0.00085	0.00054	0.000491	0.000854	0.00238	0.011	0.00145	0.13	0.000011	0.0062	0.00802	<0.010	0.423
GL South- 11m	0.00093	0.00034	0.000216	0.000865	0.00184	0.123	0.00216	0.111	-	0.0063	0.00876	<0.010	0.308
GL South- 12m	0.00098	0.00044	0.000216	0.000724	0.00283	0.13	0.00639	0.102	-	0.0079	0.00873	<0.010	0.297
GL South- 13m	0.00107	0.0003	0.000191	0.000543	0.00318	0.114	0.00737	0.0967	-	0.0076	0.00812	<0.010	0.238
GL South- 14m	0.00102	0.00056	0.000158	0.000503	0.0027	0.115	0.00602	0.0953	-	0.0074	0.00879	<0.010	0.241
GL South- 15m	0.00086	0.00068	0.000106	0.000436	0.00193	0.199	0.00347	0.0865	-	0.0061	0.00916	<0.010	0.261
GL South- 16m	0.00086	0.00079	0.000092	0.000412	0.00167	0.232	0.00265	0.0948	-	0.0059	0.00912	<0.010	0.27
GL South- 17m	0.00087	0.00088	0.000089	0.000399	0.00158	0.232	0.00261	0.0945	-	0.0078	0.00914	<0.010	0.272
GL South- 18m	0.00068	0.00053	0.000101	0.000377	0.00168	0.228	0.00267	0.0928	-	0.0067	0.0089	<0.010	0.265
GL South- 19m	0.00093	0.00071	0.000084	0.000394	0.00162	0.233	0.00287	0.0944	-	0.0071	0.00917	<0.010	0.263
GL South- 20m	0.00072	0.00059	0.000084	0.000409	0.00157	0.229	0.00283	0.0937	-	0.0074	0.00924	<0.010	0.266
GL South- 22m	0.00082	0.00078	0.000083	0.000417	0.00159	0.23	0.0027	0.0932	-	0.0071	0.00939	<0.010	0.267
GL South- 30m	0.00036	0.00025	0.000071	0.000362	0.000929	0.31	0.00258	0.0948	-	0.0076	0.00879	<0.010	0.076
GL South- 40m	0.00036	0.00044	0.000083	0.000375	0.00117	0.307	0.00261	0.0964	-	0.0059	0.00923	<0.010	0.0747

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	<0.00020	<0.00020	0.000598	0.000066	0.00108	<0.010	0.000571	0.00965	<0.000010	<0.0050	0.00379	<0.010	0.232
GL South- 4m	<0.00020	<0.00020	0.000615	0.000112	0.000963	<0.010	0.000322	0.00994	-	<0.0050	0.00375	<0.010	0.23
GL South- 5m	<0.00020	<0.00020	0.000636	0.000076	0.00105	0.011	0.000517	0.0103	-	<0.0050	0.00404	<0.010	0.25
GL South- 6m	<0.00020	<0.00020	0.000628	0.000137	0.00104	<0.010	0.000226	0.00971	-	<0.0050	0.00398	<0.010	0.24
GL South- 7m	<0.00020	<0.00020	0.000668	0.000081	0.00127	0.025	0.00289	0.0106	-	<0.0050	0.00409	<0.010	0.252
GL South- 8m	<0.00020	0.00027	0.000628	0.000123	0.00125	0.012	0.000423	0.00983	-	<0.0050	0.00397	<0.010	0.228
GL South- 9m	<0.00020	<0.00020	0.00256	0.000151	0.00231	<0.010	0.000956	0.0238	-	<0.0050	0.00761	<0.010	0.916
GL South- 10m	0.0007	0.00034	0.000983	0.00076	0.00272	0.011	0.00288	0.114	<0.000010	<0.0050	0.00789	<0.010	0.496
GL South- 11m	0.00092	0.00046	0.000246	0.000887	0.00171	0.17	0.0034	0.103	-	<0.0050	0.00858	<0.010	0.3
GL South- 12m	0.00088	0.00035	0.000171	0.00079	0.00213	0.179	0.00384	0.0977	-	<0.0050	0.00894	<0.010	0.283
GL South- 13m	0.00095	0.00035	0.000205	0.000682	0.00255	0.153	0.00627	0.0905	-	0.0058	0.00867	<0.010	0.25
GL South- 14m	0.00081	0.00044	0.000114	0.000485	0.0019	0.198	0.0041	0.0811	-	<0.0050	0.00842	<0.010	0.203
GL South- 15m	0.00067	0.00052	0.000083	0.000402	0.00127	0.245	0.0021	0.0832	-	0.0056	0.00886	<0.010	0.211
GL South- 16m	0.0006	0.00047	0.000083	0.000369	0.00112	0.228	0.00272	0.0785	-	0.005	0.00821	<0.010	0.193
GL South- 17m	0.00074	0.00028	0.000067	0.000423	0.0011	0.214	0.00192	0.0792	-	0.0058	0.00816	<0.010	0.198
GL South- 18m	0.00072	0.00047	0.000074	0.000395	0.00105	0.207	0.00233	0.0845	-	<0.0050	0.00854	<0.010	0.198
GL South- 19m	0.00064	0.0004	0.000071	0.000395	0.00118	0.239	0.00201	0.0832	-	<0.0050	0.00903	<0.010	0.201
GL South- 20m	0.00072	0.00051	0.000074	0.000442	0.00119	0.241	0.00193	0.0834	-	<0.0050	0.00891	<0.010	0.206

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m													
GL South- 4m													
GL South- 5m													
GL South- 6m													
GL South- 7m													
GL South- 8m													
GL South- 9m													
GL South- 10m													
GL South- 11m													
GL South- 12m													
GL South- 13m													
GL South- 14m													
GL South- 15m													
GL South- 16m													
GL South- 17m													
GL South- 18m													
GL South- 19m													
GL South- 20m													
GL South- 22m													
GL South- 30m													
GL South- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3A Continued
MID WINTER SAMPLING EVENT - JANUARY 27, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-	7.7	3.3	<0.0050
GL South- 4m	<0.020	7.7	<3.0	-
GL South- 5m	-	7.7	<3.0	-
GL South- 6m	-	7.7	3.3	-
GL South- 7m	-	7.7	<3.0	-
GL South- 8m	<0.020	7.6	<3.0	-
GL South- 9m	-	34.1	5.8	-
GL South- 10m	-	55.9	26.7	0.0098
GL South- 11m	-	62	31.3	-
GL South- 12m	<0.020	62.7	30	-
GL South- 13m	-	62.8	21.3	-
GL South- 14m	-	62.9	33.3	-
GL South- 15m	-	62.6	34	-
GL South- 16m	<0.020	62.7	41.3	-
GL South- 17m	-	61.5	33.3	-
GL South- 18m	-	61	40	-
GL South- 19m	-	62.3	15.3	-
GL South- 20m	<0.020	63	9.1	-
GL South- 22m	-	63.4	17.8	-
GL South- 30m	-	60.6	26	-
GL South- 40m	<0.020	61.7	38	-

Footnotes: Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.

GARROW LAKE - STATION 262-3A Continued
MAXIMUM ICE THICNESS SAMPLING EVENT - MAY 3, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-	8.2	<3.0	<0.0050
GL South- 4m	-	8.2	<3.0	-
GL South- 5m	-	8.1	<3.0	-
GL South- 6m	-	8.1	<3.0	-
GL South- 7m	-	8.1	<3.0	-
GL South- 8m	-	8.2	<3.0	-
GL South- 9m	-	32.9	7	-
GL South- 10m	<0.020	58.7	23.7	0.0172
GL South- 11m	-	63	35	-
GL South- 12m	-	63.5	25	-
GL South- 13m	-	63.6	16.3	-
GL South- 14m	0.044	63.6	27	-
GL South- 15m	-	11.4	11.4	-
GL South- 16m	-	28.7	28.7	-
GL South- 17m	0.026	27.4	27.4	-
GL South- 18m	-	16.7	16.7	-
GL South- 19m	-	17.4	17.4	-
GL South- 20m	0.025	20.1	20.1	-

Footnotes:

Data for TSS is believed to be incorrect. Believe that the laboratory did not rinse the salt off the filter paper. This will overstate TSS values.

GARROW LAKE - STATION 262-3A Continued
MINIMUM ICE THICNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m				
GL South- 4m				
GL South- 5m				
GL South- 6m				
GL South- 7m				
GL South- 8m				
GL South- 9m				
GL South- 10m				
GL South- 11m				
GL South- 12m				
GL South- 13m				
GL South- 14m				
GL South- 15m				
GL South- 16m				
GL South- 17m				
GL South- 18m				
GL South- 19m				
GL South- 20m				
GL South- 22m				
GL South- 30m				
GL South- 40m				

Footnotes:

GARROW LAKE MONITORING - STATION 262 - 3 (MID LAKE)

	MID WINTER 26-Jan-04				MAXIMUM ICE THICKNESS 03-May-04				MINIMUM ICE THICKNESS Unable to Sample Due to Ice Conditions			
Depth (m)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)
0	-	-	-	-	-	-	-		-	-	-	-
1	-	-	-	-	-	-	-		-	-	-	-
1.5	-	-	-	-	-	-	-		-	-	-	-
2	-	-	-	-	-	-	-		-	-	-	-
3	-0.37	7.7	8.29	14.4								
4	0.38	7.7	9.95	14.09	GLL to supply data - tests were							
5	0.98	7.7	10.87	13.59	conducted as required							
6	1.3	7.7	10.89	13.55								
7	1.85	7.7	10.9	13.05								
8	2.03	7.7	10.9	12.92								
9	2.32	7.7	10.93	12.83								
10	2.49	7.5	10.9	12.74								
11	3.2	7	10.94	11.8								
12	4.03	6.8	12.91	10								
13	5.08	6.8	41.8	6.75								
14	6.59	6.8	63.3	7.18								
15	8.45	6.8	78.5	3.03								
16	8.7	6.8	80.7	2.32								
17	8.8	6.8	81.3	1.86								
18	8.89	6.8	81.4	1.66								
19	8.89	6.8	81.7	1.3								
20	9.05	6.8	82	0.97								
21	9.12	6.8	82.1	0.71								
22	9.12	6.8	82.1	0.62								
23	9.12	6.8	82.1	0.53								
24	9.12	6.8	82.2	0.45								
25	9.12	6.8	82.1	0.4								
26	9.12	6.8	82.1	0.35								
27	9.12	6.7	82.2	0.32								
28	9.12	6.7	82.2	0.28								
29	9.12	6.7	82.2	0.25								
30	9.12	6.7	82.1	0.23								
31	9.12	6.7	82.2	0.21								
32	9.12	6.7	82.2	0.19								
33	9.12	6.7	82.2	0.17								
34	9.12	6.7	82.2	0.15								
35	9.12	6.6	82.2	0.13								
36	9.12	6.6	82.2	0.12								
37	9.12	6.6	82.2	0.11								
38	9.13	6.6	82.5	0.11								
39	9.16	6.6	82.5	0.11								
40	9.25	6.6	83.9	0.1								

GARROW LAKE MONITORING - STATION 262 - 3A (NEAR OUTLET)

	MID WINTER 27-Jan-04				MAXIMUM ICE THICKNESS 03-May-04				MINIMUM ICE THICKNESS Unable to Sample Due to Ice Conditions			
Depth (m)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Temp (C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)
0	-	-	-	-	-	-	-		-	-	-	-
1	-	-	-	-	-	-	-		-	-	-	-
1.5	-	-	-	-	-	-	-		-	-	-	-
2	-	-	-	-	-	-	-		-	-	-	-
3	-0.3	8.36	12.4	19.2	GLL to supply data - tests were							
4	2.8	8.35	12.5	18.0	conducted as required							
5	3.3	8.34	12.4	17.5								
6	3.3	8.34	12.4	17.5								
7	3.3	8.34	12.5	17.4								
8	3.3	8.32	12.5	16.3								
9	4.1	8.26	13.0	12.4								
10	5.4	7.9	28.1	6.1								
11	6.8	7.56	76.1	0.1								
12	7.8	7.5	80.4	0.1								
13	8.0	7.5	80.6	0.1								
14	8.2	7.49	80.8	0.1								
15	8.3	7.5	80.7	0.1								
16	8.3	7.49	80.7	0.1								
17	8.3	7.49	80.8	0.1								
18	8.3	7.49	80.8	0.1								
19	8.3	7.49	80.8	0.1								
20	8.3	7.48	80.8	0.1								
21	8.3	7.48	80.8	0.1								
22	8.3	7.48	80.8	0.1								
23	8.3	7.48	80.8	0.1								
24	8.3	7.48	80.8	0.1								
25	8.3	7.48	80.9	0.1								
26	8.3	7.47	80.9	0.1								
27	8.4	7.47	80.9	0.1								
28	8.4	7.46	80.9	0.1								
29	8.4	7.46	80.8	0.1								
30	8.4	7.44	80.9	0.1								
31	8.4	7.43	80.9	0.1								
32	8.4	7.43	80.9	0.1								
33	8.4	7.43	80.9	0.1								
34	8.4	7.42	80.9	0.1								
35	8.4	7.41	80.8	0.1								

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 26, 2004

	Total Metals Detection Limits (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 22m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 30m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 40m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to Ice can not sample the top 2 metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Detection Limits (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL Mid- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL MId- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 22m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 30m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL Mid- 40m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Detection Limits (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL Mid- 3m													
GL Mid- 4m													
GL Mid- 5m													
GL Mid- 6m													
GL Mid- 7m													
GL Mid- 8m													
GL Mid- 9m													
GL Mid- 10m													
GL Mid- 11m													
GL Mid- 12m													
GL Mid- 13m													
GL Mid- 14m													
GL Mid- 15m													
GL Mid- 16m													
GL Mid- 17m													
GL Mid- 18m													
GL Mid- 19m													
GL Mid- 20m													
GL Mid- 22m													
GL Mid- 30m													
GL Mid- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3 Continued
MID WINTER SAMPLING EVENT - JANUARY 26, 2004

	Detection Limits			
	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-			
GL Mid- 4m	0.02			
GL Mid- 5m	-			
GL Mid- 6m	-			
GL Mid- 7m	-			
GL Mid- 8m	0.02			
GL Mid- 9m	-			
GL Mid- 10m	-			
GL Mid- 11m	-			
GL Mid- 12m	0.02			
GL Mid- 13m	-			
GL Mid- 14m	-			
GL Mid- 15m	-			
GL Mid- 16m	0.02			
GL Mid- 17m	-			
GL Mid- 18m	-			
GL Mid- 19m	-			
GL Mid- 20m	0.02			
GL Mid- 22m	-			
GL Mid- 30m	-			
GL Mid- 40m	0.02			

Footnotes:

GARROW LAKE - STATION 262-3 Continued
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Detection Limits			
	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m	-	1	3	
GL Mid- 4m	0.02	1	3	
GL Mid- 5m	-	1	3	
GL Mid- 6m	-	1	3	
GL Mid- 7m	-	1	3	
GL Mid- 8m	0.02	1	3	
GL Mid- 9m	-	1	3	
GL Mid- 10m	-	1	3	
GL Mid- 11m	-	1	3	
GL Mid- 12m	0.02	1	3	
GL Mid- 13m	-	1	3	
GL Mid- 14m	-	1	3	
GL Mid- 15m	-	1	3	
GL MId- 16m	0.02	1	3	
GL Mid- 17m	-	1	3	
GL Mid- 18m	-	1	3	
GL Mid- 19m	-	1	3	
GL Mid- 20m	0.02	1	3	
GL Mid- 22m	-			
GL Mid- 30m	-			
GL Mid- 40m	0.02			

Footnotes:

GARROW LAKE - STATION 262-3 Continued
MINIMUM ICE THICKNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Detection Limits			
	Inorganic Parameters	**Physical Tests**		**Cyanides**
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL Mid- 3m				
GL Mid- 4m				
GL Mid- 5m				
GL Mid- 6m				
GL Mid- 7m				
GL Mid- 8m				
GL Mid- 9m				
GL Mid- 10m				
GL Mid- 11m				
GL Mid- 12m				
GL Mid- 13m				
GL Mid- 14m				
GL Mid- 15m				
GL Mid- 16m				
GL Mid- 17m				
GL Mid- 18m				
GL Mid- 19m				
GL Mid- 20m				
GL Mid- 22m				
GL Mid- 30m				
GL Mid- 40m				

Footnotes:

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MID-WINTER SAMPLING EVENT - JANUARY 27, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 22m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 30m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 40m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 4m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 5m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 6m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 7m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 8m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 9m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 10m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	0.00001	0.005	0.00005	0.01	0.0005
GL South- 11m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 12m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 13m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 14m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 15m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 16m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 17m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 18m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 19m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005
GL South- 20m	0.0002	0.0002	0.00002	0.00005	0.00005	0.01	0.00005	0.00005	-	0.005	0.00005	0.01	0.0005

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Due to ice can not sample the top two metres

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS

MINIMUM ICE THICKNESS SAMPLING EVENT - 2004

NOT ABLE TO DO AS ICE DID NOT LEAVE LAKE, COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Total Metals Concentrations (mg/L)												
Sample ID	Antimony	Arsenic	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Uranium	Zinc
GL South- 3m													
GL South- 4m													
GL South- 5m													
GL South- 6m													
GL South- 7m													
GL South- 8m													
GL South- 9m													
GL South- 10m													
GL South- 11m													
GL South- 12m													
GL South- 13m													
GL South- 14m													
GL South- 15m													
GL South- 16m													
GL South- 17m													
GL South- 18m													
GL South- 19m													
GL South- 20m													
GL South- 22m													
GL South- 30m													
GL South- 40m													

Footnotes: Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

GARROW LAKE - STATION 262-3A Continued
MID WINTER SAMPLING EVENT - JANUARY 27, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-			
GL South- 4m	0.02			
GL South- 5m	-			
GL South- 6m	-			
GL South- 7m	-			
GL South- 8m	0.02			
GL South- 9m	-			
GL South- 10m	-			
GL South- 11m	-			
GL South- 12m	0.02			
GL South- 13m	-			
GL South- 14m	-			
GL South- 15m	-			
GL South- 16m	0.02			
GL South- 17m	-			
GL South- 18m	-			
GL South- 19m	-			
GL South- 20m	0.02			
GL South- 22m	-			
GL South- 30m	-			
GL South- 40m	0.02			

Footnotes:

GARROW LAKE - STATION 262-3A Continued
MAXIMUM ICE THICNESS SAMPLING EVENT - MAY 3, 2004

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m	-	-	-	0.005
GL South- 4m	-	-	-	-
GL South- 5m	-	-	-	-
GL South- 6m	-	-	-	-
GL South- 7m	-	-	-	-
GL South- 8m	-	-	-	-
GL South- 9m	-	-	-	-
GL South- 10m	0.02	-	-	0.005
GL South- 11m	-	-	-	-
GL South- 12m	-	-	-	-
GL South- 13m	-	-	-	-
GL South- 14m	0.02	-	-	-
GL South- 15m	-	1	3	-
GL South- 16m	-	1	3	-
GL South- 17m	0.02	1	3	-
GL South- 18m	-	1	3	-
GL South- 19m	-	1	3	-
GL South- 20m	0.02	1	3	-

Footnotes:

GARROW LAKE - STATION 262-3A Continued
MINIMUM ICE THICNESS SAMPLING EVENT - 2004
COULD NOT SAFELY ACCESS SAMPLING LOCATION

	Inorganic Parameters	Physical Tests		Cyanides
Sample ID	Sulphide S	Salinity o/oo	Total Suspended Solids	Total Cyanide CN
GL South- 3m				
GL South- 4m				
GL South- 5m				
GL South- 6m				
GL South- 7m				
GL South- 8m				
GL South- 9m				
GL South- 10m				
GL South- 11m				
GL South- 12m				
GL South- 13m				
GL South- 14m				
GL South- 15m				
GL South- 16m				
GL South- 17m				
GL South- 18m				
GL South- 19m				
GL South- 20m				
GL South- 22m				
GL South- 30m				
GL South- 40m				

Footnotes:

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS
MID WINTER SAMPLING EVENT - JANUARY 26, 2004
DUPLICATE RESULTS

Project	Polaris SNP Saline Water Analysis (Garrow Lake)
Report to	Gartner Lee Ltd.
ALS File No.	T9117
Date Received	30/01/2004
Date:	20/02/2004

Sample ID		**GL Mid- 7m**	**GL Mid- 7m**	**RPD %**	**GL Mid- 16m**	**GL Mid- 16m**	**RPD %**
Date Sampled		26/01/2004	QC# 373743		26/01/2004	QC# 373744	
Time Sampled							
ALS Sample ID		5			14		
Nature		Water			Water		
Total Metals							
Arsenic	T-As	0.00029	<0.00020	36.7	0.00069	0.00089	25.3
Cadmium	T-Cd	0.000493	0.000492	0.203	0.000082	0.000085	3.59
Cobalt	T-Co	0.000061	0.000062	1.63	0.000402	0.000415	3.18
Copper	T-Cu	0.000976	0.000944	3.33	0.00143	0.00145	1.39
Iron	T-Fe	<0.010	<0.010	0	0.211	0.223	5.53
Lead	T-Pb	0.000794	0.000689	14.2	0.00255	0.00254	0.393
Manganese	T-Mn	0.00819	0.00807	1.48	0.0857	0.0876	2.19
Molybdenum	T-Mo	<0.0050	<0.0050	0	0.0073	0.0069	5.63
Nickel	T-Ni	0.00341	0.00315	7.93	0.00896	0.00919	2.53
Uranium	T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc	T-Zn	0.197	0.188	4.68	0.265	0.271	2.24
Inorganic Parameters							
Sulphide	S	-	-	-	<0.020	<0.020	0

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004
DUPLICATE RESULTS

Project	40137 Saline Water Analysis Garrow SNP (Polaris)
Report to	Gartner Lee Ltd.
ALS File No.	U3258
Date Received	07/05/2004
Date:	21/05/2004

Sample ID		**GL Mid- 6m**	**GL Mid- 6m**	**RPD %**	**GL Mid- 12m**	**GL Mid- 12m**	**RPD %**
Date Sampled		03/05/2004	QC# 385669		03/05/2004	QC# 385670	
Time Sampled							
ALS Sample ID		4			10		
Nature		Water			Water		
Total Metals							
Antimony	T-Sb	<0.00020	<0.00020	0	0.00096	0.00105	8.96
Arsenic	T-As	<0.00020	0.00023	14	0.00046	0.00046	0
Cadmium	T-Cd	0.000617	0.000636	3.03	0.000207	0.00024	14.8
Cobalt	T-Co	0.000066	0.00007	5.88	0.000751	0.000814	8.05
Copper	T-Cu	0.00102	0.00102	0	0.00218	0.00242	10.4
Iron	T-Fe	<0.010	0.01	0	0.173	0.195	12
Lead	T-Pb	0.00168	0.00138	19.6	0.00682	0.00783	13.8
Manganese	T-Mn	0.00957	0.00968	1.14	0.0971	0.112	14.3
Molybdenum	T-Mo	<0.0050	<0.0050	0	<0.0050	0.0064	24.6
Nickel	T-Ni	0.00385	0.00383	0.521	0.00821	0.009	9.18
Uranium	T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc	T-Zn	0.229	0.233	1.73	0.262	0.28	6.64

GARROW LAKE - STATION 262 - 3 (MID LAKE) - TOTAL METALS ANALYSIS
MINIMUM ICE THICKNESS SAMPLING EVENT - NOT SAMPLED
DUPLICATE RESULTS

Project	
Report to	
ALS File No.	
Date Received	
Date:	

Sample ID		**RPD %**	**RPD %**
Date Sampled			
Time Sampled			
ALS Sample ID			
Nature			
Total Metals			
Antimony	T-Sb		
Arsenic	T-As		
Cadmium	T-Cd		
Cobalt	T-Co		
Copper	T-Cu		
Iron	T-Fe		
Lead	T-Pb		
Manganese	T-Mn		
Molybdenum	T-Mo		
Nickel	T-Ni		
Uranium	T-U		
Zinc	T-Zn		

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS
MID WINTER SAMPLING EVENT - JANUARY 26, 2004
DUPLICATE RESULTS

Project	Polaris SNP Saline Water Analysis (Garrow Lake)
Report to	Gartner Lee Ltd.
ALS File No.	T9118
Date Received	30/01/2004
Date:	20/02/2004

Sample ID	**GL South- 7m**	**GL South- 7m**	**RPD %**	**GL South- 16m**	**GL South- 16m**	**RPD %**
Date Sampled	27/01/2004	QC# 373745		27/01/2004	QC# 373746	
Time Sampled						
ALS Sample ID	5			14		
Nature	Water			Water		
Total Metals						
Arsenic T-As	<0.00020	<0.00020	0	0.00079	0.00073	7.89
Cadmium T-Cd	0.000522	0.000562	7.38	0.000092	0.000088	4.44
Cobalt T-Co	0.000067	0.000076	12.6	0.000412	0.000396	3.96
Copper T-Cu	0.000916	0.000896	2.21	0.00167	0.00161	3.66
Iron T-Fe	<0.010	<0.010	0	0.232	0.229	1.3
Lead T-Pb	0.000325	0.000173	61	0.00265	0.00263	0.758
Manganese T-Mn	0.00906	0.0093	2.61	0.0948	0.094	0.847
Molybdenum T-Mo	<0.0050	<0.0050	0	0.0059	0.0072	19.8
Nickel T-Ni	0.00361	0.00372	3	0.00912	0.00907	0.55
Uranium T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc T-Zn	0.208	0.231	10.5	0.27	0.265	1.87
Inorganic Parameters						
Sulphide S	-	-	-	<0.020	<0.020	0

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS
MAXIMUM ICE THICKNESS SAMPLING EVENT - MAY 3, 2004
DUPLICATE RESULTS

Project	40137 Saline Water Analysis Garrow SNP (Polaris)
Report to	Gartner Lee Ltd.
ALS File No.	U3253
Date Received	07/05/2004
Date:	21/05/2004

Sample ID	**GL South- 4m**	**GL South- 4m**	**RPD %**	**GL South- 15m**	**GL South- 15m**	**RPD %**
Date Sampled	03/05/2004	QC# 385637		03/05/2004	QC# 385638	
Time Sampled						
ALS Sample ID	2			13		
Nature	Water			Water		
Physical Tests						
Salinity o/oo	-	-	-	64.4	64.3	0.155
Total Metals						
Antimony T-Sb	<0.00020	<0.00020	0	0.00067	0.00077	13.9
Arsenic T-As	<0.00020	<0.00020	0	0.00052	0.00065	22.2
Cadmium T-Cd	0.000615	0.00061	0.816	0.000083	0.000082	1.21
Cobalt T-Co	0.000112	0.000075	39.6	0.000402	0.000451	11.5
Copper T-Cu	0.000963	0.00106	9.59	0.00127	0.0012	5.67
Iron T-Fe	<0.010	<0.010	0	0.245	0.235	4.17
Lead T-Pb	0.000322	0.000329	2.15	0.0021	0.00214	1.89
Manganese T-Mn	0.00994	0.01	0.602	0.0832	0.0804	3.42
Molybdenum T-Mo	<0.0050	<0.0050	0	0.0056	0.0056	0
Nickel T-Ni	0.00375	0.004	6.45	0.00886	0.00847	4.5
Uranium T-U	<0.010	<0.010	0	<0.010	<0.010	0
Zinc T-Zn	0.23	0.247	7.13	0.211	0.201	4.85

GARROW LAKE - STATION 262 - 3A (NEAR OUTLET) - TOTAL METALS ANALYSIS
MINIMUM ICE THICKNESS SAMPLING EVENT - NOT SAMPLED
DUPLICATE RESULTS

Project	
Report to	
ALS File No.	
Date Received	
Date:	

Sample ID	**RPD %**	**RPD %**
Date Sampled		
Time Sampled		
ALS Sample ID		
Nature		
Total Metals		
Antimony T-Sb		
Arsenic T-As		
Cadmium T-Cd		
Cobalt T-Co		
Copper T-Cu		
Iron T-Fe		
Lead T-Pb		
Manganese T-Mn		
Molybdenum T-Mo		
Nickel T-Ni		
Uranium T-U		
Zinc T-Zn		

APPENDIX 19

CORRESPONDENCE BETWEEN

TECK COMINCO AND ENVIRONMENT CANADA

REGARDING THE APPLICATION OF THE

METAL MINING EFFLUENT REGULATIONS

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC V6K 2G8

Phone: 604-730-1220
Fax: 604-739-8511

Our File #: TC-03-03

March 29, 2004

Sidney F. Bruinsma
Enforcement/Emergencies Officer, Nunavut
Northern Division, Environmental Protection Branch
Environment Canada
Box 1870, Iqaluit
Nunavut X0A 0H0

Dear Mr. Bruinsma:

Re: Polaris Mine EEM – Missed Sublethal Toxicity Test Sampling Event

Further to our recent discussion, we are pleased to document the issues and circumstances surrounding the missed 2003 sampling event for sublethal toxicity testing (SLTT) of effluent at Teck Cominco's Polaris Mine.

First, Azimuth Consulting Group (Azimuth) takes full responsibility for the missed sampling event, which resulted from an oversight on our part. Our staff have considerable experience conducting environmental effects monitoring (EEM) programs under the Pulp and Paper Effluent Regulations (PPER), which have been in place for some years. We understand the importance of the SLTT as an EEM investigative tool and would not knowingly miss a sampling event. The oversight comes from our interpretation of the new Metal Mining Effluent Regulations (MMER) and how they apply to the Polaris Mine, which has a unique discharge situation (i.e., limited to approximately 60 days per calendar year). Under both the PPER and MMER, two sampling events are required for the SLTT. However, if the discharge period is less than 120 days, the PPER require only one sampling event. We mistakenly assumed that these terms would also apply to the MMER, which provide less detail pertaining to the requirements of this test than the PPER. This issue was compounded by the unique discharge characteristics and receiving environment of the Polaris Mine, which make the MMER more difficult to interpret and apply compared to mines discharging under more usual conditions.

We became aware of the missed SLTT event during a December 2003 workshop intended to present results of 2003 reconnaissance studies carried out at the mine and to seek feedback from the Technical Advisory Committee (TAP) on our proposed study design for the Polaris Mine. Following our presentation, Ms. Sandra Blenkinsopp pointed out that two sampling events were indeed required under MMER. She then indicated that Environment Canada would contact us to further discuss the implications of this matter.

We agree that the missed SLTT event is unfortunate and will ensure that this test is carried out twice during the 2004 and 2005 discharge periods.

Please do not hesitate to contact us if you have any questions or require further clarification.

Sincerely,
Azimuth Consulting Group Inc.

Patrick Allard, M.Sc., R.P.Bio.

cc: Randy Baker (Azimuth)
Bruce Donald (Teck Cominco)

Environment Canada
Environmental Protection Branch
Prairie and Northern Region
Northern Division
P.O. Box 1870 Iqaluit, Nunavut
X0A 0H0

PROTECTED

Occurrence File: 4408-2004-03-11-003

27 April 2004

WITHOUT PREJUDICE

Mr. David Thompson
Deputy Chairman and CEO
Teck Cominco Metals Ltd.
Suite 600 – 200 Burrard Street
Vancouver, British Columbia
V6C 3L9

and

Mr. John Knapp
Manager of Operations
Teck Cominco Metals Ltd.
Polaris Mine Operation
Polaris, Little Cornwallis Island, Nunavut
X0A 0Y0

RE: ***FISHERIES ACT;***
Metal Mining Effluent Regulations, Environmental Effects Monitoring
Part 1, Section 6(1)

The purpose of this correspondence is to remind Teck Cominco Metals Ltd. and John Knapp, in his capacity as Manager of Operations, Polaris Mine, in the Territory of Nunavut, of their obligations under the Environmental Effects Monitoring provisions of the Metal Mining Effluent Regulations of the *Fisheries Act*. It relates to a report of February 24, 2004 by Azimuth Consulting Group Ltd., acting as an agent for Teck Cominco Metals Ltd. and its officers. This correspondence sets out in writing the circumstances surrounding a failure to collect the appropriate samples as outlined within the regulations to wit: Part 1, Section 6, Environmental Effects Monitoring Studies of the Metal Mining Effluent Regulations.

../1

On 24 February 2004, Azimuth Consulting Group Ltd. had discussions with Environment Canada's Prairie and Northern Region, Senior Environmental Effects Monitoring Coordinator, Sandra Blenkinsopp. It was at this time that the deficiency in sampling was noted by Environment Canada. Azimuth Consulting Group acting as a contractor for Teck Cominco Metals Ltd. stated it had only collected a single sample for Sub-lethal Toxicity Testing (SLTT) contrary to the regulation requirements which required two samples to be collected.

Subsequently this matter was reported to the enforcement section of the Environmental Protection Branch of Environment Canada on the same day. Once I was notified I contacted Mr. Patrick Allard of Azimuth Consulting Group Ltd. requesting information on the circumstances surrounding this failure to meet the requirements of the Fisheries Act. Mr. Allard provided a letter to Environment Canada outlining the issues pertaining to the oversight by Azimuth Consulting Group Ltd. This letter was later also forwarded with the revised Polaris Mine - 2003 ANNUAL Metal Mining Effluent Regulations Summary Report dated March 31, 2004 and sent to Mr. Peter Blackall, Regional Director of Environmental Protection.

Environment Canada recognizes through these correspondences that Teck Cominco Metals Ltd. has taken measures to correct the aforementioned situation. Accordingly, a formal Warning Letter will not be issued in these circumstances.

This correspondence is intended to bring this matter to your attention in order for you to take necessary action to prevent a repeat of the circumstances described herein. In conclusion no further enforcement action is being considered or deemed warranted at this time. Environment Canada will be closing our file on this incident.

If you have any questions or require clarification, please contact the undersigned at (867) 975-4644.

Sidney Frank Bruinsma
Fisheries Act Inspector

cc: Craig Broome – Head of Enforcement Environmental Protection
Prairie and Northern Region, Environment Canada

../2

Bruce J. Donald
Reclamation Manager

April 27, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – Alteration of System at Final Discharge Point at Garrow Dam

As required under Section 10(2) of the Metal Mining Effluent Regulations, please be advised that the siphons at Garrow Lake dam will not be used for discharging effluent this summer. As part of our decommissioning and closure activities, the dam is being partially decommissioned with a channel constructed through the decommissioned portion of the dam. Flow through the dam will be via the original creek channel starting with this year's effluent discharge season. Sampling of the effluent will be continued from the same location as in previous years so that a change in the location of the Final Discharge Point is not being contemplated.

Yours truly,

Original signed by B. Donald

Bruce Donald

cc:
Walter Kuit (Teck Cominco Limited)
Bob Hutchinson (Teck Cominco Limited)
Trevor Feduniak (Teck Cominco Limited)
Joe Dahoy (Cascade Mgmt)
Randy Baker (Azimuth Consulting Group)

Polaris Mine EEM - Outline of Study Design for Biological Monitoring Studies

Highlights:

- Program builds on 1) results of historical studies covering pre-mining and operational periods; 2) findings of 2003 reconnaissance studies (i.e., field effluent plume delineation, underwater video survey, fish survey, and sediment survey); 3) theoretical effluent plume modeling; and 4) considerable feedback obtained during consultations with the Technical Advisory Panel (TAP) as part of two workshops (April and December 2003) and follow-up discussions.

- Approach consists of a Control/Impact design focusing on one high exposure area (i.e., aquatic receiving environment that is nearest to the mouth of Garrow Creek and that contains an appropriate habitat type with sufficient geographic area to accommodate the necessary number of replicate stations; Environment Canada, 2002) and one reference area. Both areas are located in Garrow Bay, approximately 1 km apart (see attached figure).

- Our rationale for targeting one high exposure area, rather than multiple near-field and far-field exposure areas, follows guidance from Environment Canada (2002) and reflects findings of the 2003 reconnaissance studies which clearly indicated the lack of an exposure gradient between the mouth of Garrow Creek and the reference area.

- The field program is planned from August 11th - 25th 2004, when the likelihood of safe access to Garrow Bay for sampling is optimal.

- Standard and accepted QAQC procedures will be used throughout the program.

- The proposed study design is optimistic. While every attempt will be made to achieve the goals of the program, field conditions and safety issues may require us to focus on a few priority study components. As discussed with members of the TAP, all clam, benthos, and sediment collections will be diver-assisted, so local weather and ice conditions will dictate level of effort. We propose the following priorities and would appreciate feeback from the TAP: 1) fish survey and tissue analyses; 2) supporting environmental variables (water and sediment quality surveys); 3) SIMS survey (faster to accomplish and provides semi-quantitative basis for evaluating any gross impacts to marine communities); and 4) benthic invertebrate community survey (time intensive given replication required to achieve statistically sound assessment).

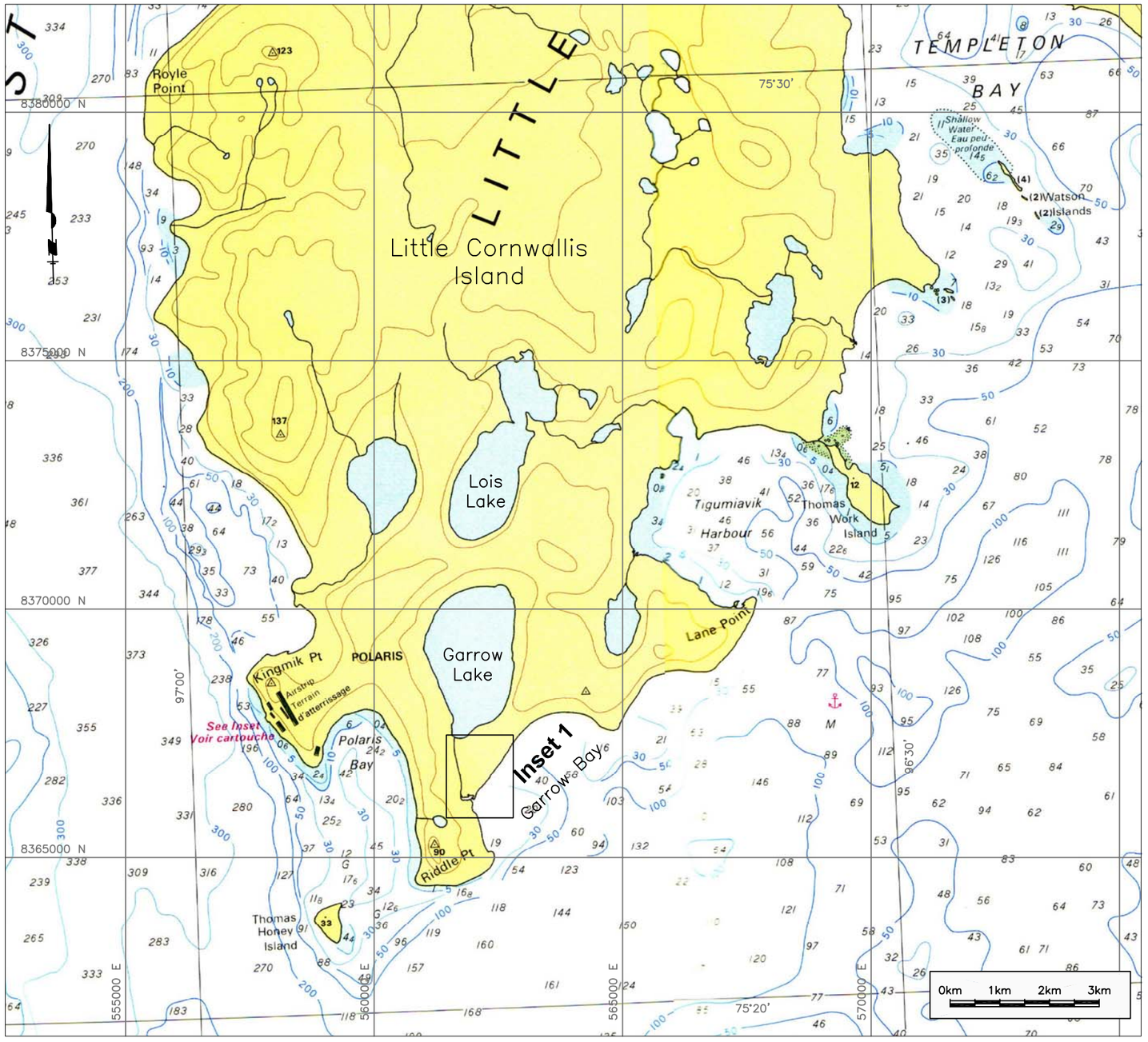
Study Component	Sampling Areas	Sample Size and Replication		Mesurement Endpoints	Sampling Method
Fish Survey and Tissue Analyses - Species selected: softshell clam (*Mya truncata*)	**Garrow Bay high exposure area**: located in the area closest to the mouth of Garrow Creek where sufficient clams can be collected (approx. 6 - 8 m depth)	- Target of 40 clams[1]	- Individual clams	- Length - Width - Whole animal wet weight - Shell weight - Soft tissue fresh weight - Gonad fresh weight - Sex - Condition index - Gonadosomatic index[2]	- Diver-assisted sampling; collection of individuals by hand, only intact clams will be retained
			- 4 soft tissue composites of 10 undepurated clams	- Tissue chemistry: moisture and lipid content, suite of metals	
	Garrow Bay reference area: located approximately 1 km to the northeast, upstream of the predominant current direction (approx. 6 - 8 m depth)	- Target of 40 clams[1]	- Individual clams	Same as high exposure area	Same as high exposure area
			- 4 soft tissue composites of 10 undepurated clams	Same as high exposure area	
Benthic Invertebrate Community Survey	**Garrow Bay high exposure area**: located in the area closest to the mouth of Garrow Creek where benthic communities can be sampled (approx. 6 - 8 m depth)	- 5 replicate stations (approx. 10 m x 10 m each and separated by approx. 50 m)	- 5 x 1L subsamples per station	- Total invertebrate density - Taxon richness - Simpson's diversity index - Bray-Curtis index - Evenness - Taxon density - Taxon proportions - Taxon presence/absence	- Diver-assisted sampling; upper 10 cm of sediment will be collected for each subsample using a 1L plastic container - All 5 x 1L subsamples for a given station will be physically pooled prior to processing - Processing will be performed using a 1 mm mesh size - Identifications will be performed to the lowest practicable taxonomic level
	Garrow Bay reference area: located approximately 1 km to the northeast, upstream of the predominant current direction (approx. 6 - 8 m depth)	- 5 replicate stations (approx. 10 m x 10 m each and separated by approx. 50 m)	- 5 x 1L subsamples per station	Same as high exposure area	Same as high exposure area

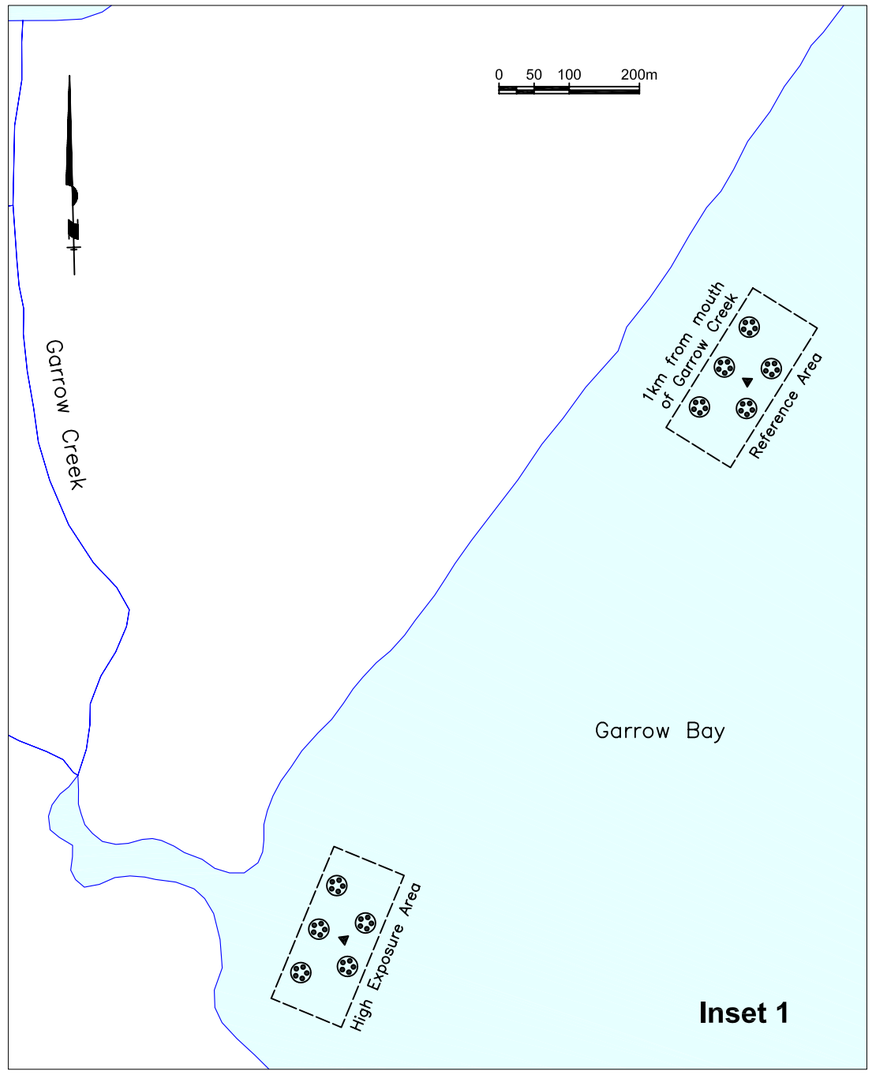
Polaris Mine EEM - Outline of Study Design for Biological Monitoring Studies

Study Component	Sampling Areas	Sample Size and Replication		Mesurement Endpoints	Sampling Method
Supporting Environmental Variables					
- Water quality monitoring	**Garrow Bay high exposure area**: location matching fish and benthic survey sampling area	- 5 replicate stations for field measurements (matching benthic replicate stations)	- Measurements made at 1 m depth intervals	- Field measurements: DO, pH, temperature, salinity, transparency and water depth	- Calibrated YSI meter, pH probe, and depthmeter will be used for all field measurements - Surface water samples will be collected directly into sample containers; all 5 subsamples for a given sampling area will be composited prior to analysis - Subsurface sampling will be conducted using divers; care will be taken not to disturb sediments during sampling; all 5 subsamples for a given sampling area will be composited prior to analysis - Timing of sampling will match routine MMER effluent characterization as well as EEM effluent and water quality monitoring
		- 1 composite surface sample for laboratory analysis	- 5 subsamples matching benthic replicate stations	- Laboratory analyses: pH, temperature, DO, hardness, alkalinity, Al, As, Cd, Cu, cyanide, Fe, Hg, Pb, Mo, Ni, Zn, TSS, ammonia, nitrate, radium 226	
		- 1 composite subsurface sample for laboratory analysis (0.25 m from bottom)	- 5 subsamples matching benthic replicate stations		
	Garrow Bay reference area: location matching fish and benthic survey sampling area	- 5 replicate stations for field measurements (matching benthic replicate stations)	- Measurements made at 1 m depth intervals	Same as high exposure area	Same as high exposure area
		- 1 composite surface sample for laboratory analysis	- 5 subsamples matching benthic replicate stations		
		- 1 composite subsurface sample for laboratory analysis (0.25 m from bottom)	- 5 subsamples matching benthic replicate stations		
- Sediment quality monitoring	**Garrow Bay high exposure area**: location matching fish and benthic survey sampling area	- 5 replicate stations (matching benthic replicate stations)	- 5 subsamples (matching benthic subsamples) per station	- Sediment chemistry: TOC, grain size, suite of metals	- Diver-assisted sampling; upper 10 cm of sediment will be collected for each subsample using a 1L plastic container - All 5 subsamples for a given station will be composited prior to analysis
	Garrow Bay reference area: location matching fish and benthic survey sampling area	- 5 replicate stations (matching benthic replicate stations)	- 5 subsamples (matching benthic subsamples) per station	Same as high exposure area	Same as high exposure area
Additional Studies - Seabed Imaging and Mapping System (SIMS)	**Garrow Bay high exposure area** and **Garrow Bay reference area**	- Numerous georeferenced tracklines within each area	- Continuous imagery	- Seabed classification maps including: substrate type, vegetation type and cover, distribution and relative abundance of macrofauna	- Towed underwater camera (SIMS) providing semi-quantitative survey of physical and biological features of the seabed

[1] During the 2003 reconnaissance studies, a total of 29 clams were collected by divers; access to Garrow Bay for diving was limited to 3 out of 14 field days due to harsh weather conditions (e.g., presence of ice flows, strong winds, blizzard). Every effort will be made during the 2004 field program to meet the mininum EEM requirement of 40 individuals per sampling area; however, the total sample size may be limited by field conditions. In addition, the inherent difficulty in identifying clam sexes in the field may result in a departure from the requirement for 20 males and 20 females.

[2] The gonadosomatic index will be determined under the supervision of Sylvie St-Jean, National Water Research Institute. The sample size will be assessed once field work is completed.





Sampling area for fish survey and benthic invertebrate community survey

Replicate station - benthos, sediment, water (field measurements)

Subsample - benthos, sediment

Surface and subsurface composite sample - water (laboratory analysis); note that subsamples will be taken from each benthic replicate station (see above)

Inset data and surrounding creeks digitized from Map 1 Sampling Sites 1980 *prepared by B.C. Research January 1978*

Other data from Crozier Strait And/Et Pullen Strait 7935 *corrected 2003-03-28 published by the Canadian Hydrographic Service*

AZIMUTH

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver BC, V6K 2G8

DRAWN BY:	CHK. BY:	PROJECT No:
BT	PA	TC-03-03
	DATE: 3/6/2004 1:04 PM	

PROJECT: Polaris

TITLE:

Polairs Mine EEM
Study Design for Biological Studies

CLIENT: Teck Cominco

Figure 1

Review of Polaris Mine EEM
Study Design Outline for Biological Monitoring Studies

Highlights Section
The benthic survey component should be given the 3rd priority rather than the 4th priority. The benthic survey is a main EEM component. If time becomes an issue, the TAP recommends that sediment and water quality sample collection be reduced as indicated in the comments below.

Fish Survey and Tissue Analysis
Gonad dry weight and animal height should be added to the list of measured endpoints.

Benthic Invertebrate Community Survey
The MMER TGD recommends that in marine systems, a stacked set of 1.0 and 0.5 mm screens be used in the field with the 0.5 mm samples being archived and processed only if appropriate.

Benthic Supporting Environmental Variables (Chapter 5 of TGD)
Please see Table 5-7 of the MM TGD for the recommended supporting explanatory variables to be measured at each station in marine/estuarine benthic invertebrate habitats. In addition to the parameters listed in your outline, this table also recommends that dissolved oxygen near the bottom, sediment Eh (redox) and sediment total sulfides, as well as substratum characteristics be measured at each benthic station.

If time is limiting, the TAP recommends that **one sediment sample be collected per station** at the same time as the benthic invertebrate sampling.

Water Quality Monitoring during biological field work (Chapter 6 of MM TGD)
If time is limiting, the TAP recommends that the water quality sample collection work be done within each fish and benthic invertebrate sampling **area at one representative station** (pg 6-5, MM TGD).

Field Measurement of Water Quality Parameters - Please note that when water depth is greater than 4m, the standard water quality parameters measurable in the field should be taken throughout the water column at one to five metre intervals depending on total depth (pg. 6-9 MM TGD). The TAP recommends that the interval at which measurements are taken be less than every meter in the upper portion of the water column, in order to pick up where the freshwater lens is, etc. It is also recommended that conductivity be added to the list of standard field measurements.

Collection of Water Samples for Laboratory Analyses - The water collected for laboratory analyses of water quality should be collected at 2 depth intervals: the subsurface and near bottom (pg. 6-10 MM TGD), as described in your outline.

FINAL MEETING MINUTES

ENVIRONMENTAL EFFECTS MONITORING
STUDY DESIGN MEETING
POLARIS MINE (TECK COMINCO) & TECHNICAL ADVISORY PANEL
Tuesday, December 16, 2003
1:00 p.m to 5:00 pm.

Bev Burns Boardroom, Environment Canada, Edmonton

Attendees:

Bruce Donald	Teck Cominco, Cranbrook
John Knapp	Teck Cominco
Randy Baker	Azimuth Consulting Group Inc., Vancouver
Patrick Allard	Azimuth Consulting Group, Inc., Vancouver
Dionne Filiatrault	Nunavut Water Board, Gjoa Haven
Chris Baron	F&O Canada, Winnipeg
Meighan Wilson	Indian and Northern Affairs, Yellowknife
Stephen Harbicht	Environment Canada, Yellowknife
Sandra Blenkinsopp	Environment Canada, Edmonton
Jenny Ferone	Environment Canada, Edmonton
Paula Siwik	Environment Canada, Edmonton

1. Attendees introduced themselves.

2. No additional items were added to the agenda.

3. Review of the objective: To discuss the findings of the August 2003 reconnaissance studies, and to incorporate these findings into a revised EEM study, scheduled for August 2004.

4. Results of the August 2003 field reconnaissance studies on water chemistry, toxicity testing, plume delineation & modeling, sediment chemistry, benthos, and fish were presented by Randy Baker and Patrick Allard. Their presentation is appended (a hard copy will be sent with the final version of the minutes). An underwater video clip was also viewed. Information from the video presentation and slide presentation is appended at the end of the minutes.

5. General Discussion on Study Design Key Components

Adult Fish Survey

- Given that fin fish were found to be very rare in Garrow Bay, clams will be used in lieu of fin fish.
- The sampling design for collecting clams was discussed, given the limitations on the divers (2 dives per day, approximately 30 -35 minutes per dive). If discrete sampling stations are used similar to a benthic invertebrate sampling design with 5 stations, the divers will only be able to collect about 5 clams per station. Further discussion is needed to confirm if 20 - 25 clams, for example, are sufficient given the variability in a natural population. Another option is to collect clams on a per area basis.
- The range of EEM endpoints found in the MMER EEM Technical Guidance for caged bivalves should be measured on the wild clams, e.g. length, width, etc. (Note: The information is found in the Alternative Monitoring Chapter - Chapter 12).
- The exposure area clams should be collected along the first depth contour where clams are exposed to the effluent from Garrow Creek. This would probably be at the 5 to 6 m depth. Note: Steve Harbicht wants to see solid baseline data from this area in the event that Garrow Lake has a release in the future.
- The reference area will be in the subtidal area to the north of the mouth of Garrow Creek. The reference area clams will be collected along the same depth contour as the exposure area clams to remove the effect of depth. Note that results from the reconnaissance work indicated that metal levels in clams and sediment in this area as well as in the exposure area were similar to background concentrations measured in Tigumiavik Harbour.
- Exposure will be assessed by conducting soft tissue analyses for a suite of metals.

Action Item: Sandra Blenkinsopp to collect information on wild clam sample size. Done - Sandra spoke with Dr. Sylvie St.-Jean en route to the EEM Science Symposium. Dr. St.-Jean suggested a minimum of 40 clams of each sex per area, which usually requires a field collection of about 120 clams.

Action Item: Sandra Blenkinsopp will send Sylvie St.-Jean's contact information to Patrick so that he can get the current information on reproductive endpoints, which are under development. Done. Patrick and Sylvie have discussed the study. Patrick indicated that it was agreed that while 40 clams of each sex per study area would be ideal, it is unlikely that such a large sample size can be achieved due to sampling limitations in Garrow Bay (e.g., diver-assisted, ice flows, weather conditions, etc). Rather, it was agreed that 40 clams total per study area will be targeted. While 20 males and 20 females are recommended for the fish survey, it was acknowledged that difficulties in sexing clams in the field may result in departures from this target ratio.

Benthic Invertebrate Community Survey

- Grabs from the surface will not work because the sediments are too hard.
- Could use diver-assisted cores or quadrats
  - Cores – subsurface too hard
  - Quadrats – difficult because of kelp beds
- Could do a combination – SIMS and diver assisted cores or through-ice cores.
- Benthic stations (5 per area) will be located along a depth contour (approx. 6 m) to remove effect of depth, using same areas as clam survey.
- Patrick suggested divers could use a 1L wide-mouth jar, and drag it at a consistent depth and in a consistent manner until full. Used this method at Burrard Inlet.
- TAP suggested increasing subsamples per station and using a smaller volume. Could possibly do 2 to 3 subsamples per 500 mL jar.
- Use of amphipods briefly discussed (& subsequently discarded).
- Unlikely to have enough time to collect samples from a far-field site. (Note to TAP: a far-field benthic site is not required for an initial MMER EEM survey.)
- SIMS will be back-up, used in same area.

Sediment Collection

- Grabs will not work because the sediments are too hard (see benthic above).
- Steve Harbicht asked about the sediment chemistry with respect to the digest, etc.

Action Item: Sandra Blenkinsopp to confirm if sediment is to be collected per station. Done - Sediment sampling is to be done at each benthic station.

Action Item: Sandra Blenkinsopp to check sediment chemistry guidance for marine environments to determine recommended digestion process for EEM. Status: In Progress.

Effluent and Water Quality Monitoring

- The effluent and water quality monitoring, which includes effluent sublethal toxicity testing, must continue for the full 3 year period until the mine receives recognized closed mine status
- Two effluent samples must be collected for sublethal toxicity testing per year. The mine indicated that it had only collected one in 2003 in 9 weeks of discharge.

Action Item: Sandra Blenkinsopp to follow up with Patrick Allard. Done. The 2004 and 2005 monitoring events will include two samples for sublethal toxicity testing.

Timing of Survey

- Survey will be conducted approximately Aug 10 – 25th, 2004.

- Based on experience during the field reconnaissance survey last year, ½ of days up there might be working days.
- Field support for divers was discussed. A lot of the infrastructure will be gone and the medical facility will be decommissioned by August. Sandra Blenkinsopp suggested that it may be better to sample in May through an ice platform when more infrastructure was present at the site. Bruce Donald indicated that effluent wouldn't be flowing in May. Sandra Blenkinsopp has discussed this site with the National EEM Office, and the National EEM Office indicated that the effluent would not have to be flowing during sampling at this site. The consultants decided to work in August. They want to concentrate on open water sampling.
- If due to inclement weather or other difficulties the survey can't be completed, Patrick asked what happens, and the following summarizes the discussion:
    - Sandra Blenkinsopp indicated that the consultants should keep in touch with her or the Authorization Officer (AO) during the field work so that the TAP can be informed if weather is causing a problem, etc., Weather problems, communications with EC, etc., should be documented by the consultants for use in writing up the interpretive report. **Human safety is of primary importance.**
    - Sandra indicated that two weeks is an acceptable level of effort to attempt to achieve the objectives of the field survey.
    - Fall-back position – Combine 2 years of data.
    - Jenny Ferone suggested prioritizing elements of study, e.g. collect clam biological endpoints first.
    - Seabed Imaging and Mapping System (SIMS – see below) will be a backup, since it will be done in the same area. There is value in having both – cores and visual.
- First weekend of September in 2004 – sea-lift. Everybody and everything goes.

Seabed Imaging and Mapping System (SIMS) – The consultants indicated that there is a F&O requirement for SIMS to be done at the dock site now that the dock structure has been removed. Ten to 15 m intervals parallel to shore will be done, followed by tows perpendicular to shore, and then oblique tows. Abundance, and presence / absence will be noted, as well as depth. Drop camera, magnify and do quadrat survey. This is a semi-quantitative method.

6. Steps Forward
    - Sandra Blenkinsopp to distribute minutes
    - Azimuth to finalize study design. Anticipate a 2 to 3 month turn-around time.
    - Randy will make a copy of the video for EC (Received by Edm Office January 7, 2004).

Video and Slide Presentation

Notes from video presentation:

- Video taken first weeks of August 2003
- Thin layer of sand/silt over cobble and gravel
- One fish; Clouds of amphipods (mysids)
- Starting at mouth of creek and moving out
- Ice scour area – rocky, no kelp
- Lot of cobble and gravel and attached kelp typical of 5 to 8 metres depth, 150 – 200 m offshore
- Stark difference in kelp/benthic community abundance between scoured intertidal and subtidal area
- Maximum depth sampled approximately 8 m. Floats were set for the collection of clams at approximately 8 m.
- Clams in softer sediments as well as between larger substrates
- Looking for clams as near to shore as possible, looking for siphons that stick out of the sand. Suspended material hung in water column
- Collected paired sediment and clam tissue samples
- Sediments collected by hand into jar prior to clam collection
- Clams (*Mya truncata*), 17 - 50 g wet body weight, approx. 4 size classes (17-19, 32, 40, & 50 g)
- Dragged a zooplankton net in shallows and collected specimens. Made a representative zooplankton collection.
- Water temperature was -0.5 to -1 ^{o}C water temp, 0 ^{o}C at surface
- 30 to 35 minutes per dive

Slide 4 - Garrow Lake Effluent Characterization

- Collected water samples weekly
- Early in the year the freshwater ice melt causes a drop in salinity
- Garrow Lake is siphoned over the dam then flows by gravity.
- Garrow Creek typical discharge was 0.1 to 0.2 m^3/s. Spring flow generally 1.5 to 2 m^3/s.
- Flow rates are higher this year because more siphons were on line.
- Approximately 20 cm remains to get lake down to level. The dam will be opened for this.
- Garrow Lake sampling performed for Fisheries & Oceans Canada in August 2003: Captured 19 sculpins, sacrificed 11; Zooplankton
- Garrow Lake top 9 or 10 m was brackish water; 2 ppt down to 7 or 8 ppt. Transition zone at 10 or 11m when salinity went from 10 to 60 ppt. Pretty well uniform at 60 ppt to bottom. Temperature inversion – about 8^{o}C at bottom.

Slide 6 – 2003 Effluent Chemistry Data

- BC Aquatic Water Quality Guidelines are marine limits based on toxicity to algae with a 2 fold safety factor

Slide 7 – Contaminants of Potential Concern

- Concentration of Zinc – low initially at ice melt and then increases
- Bruce Donald indicated that in the future Zinc concentrations should be lower, since only meltwater should be drawing down.
- High Pb, reason not known. Could have been due to new siphons.

Slide 8 – Effluent Characterization - Sublethal Toxicity Testing
- Didn't miss any holding times for getting samples to the toxicity lab in Vancouver.
- Acute Lethality Tests – included salinity controls
- SLTT – 72% v/v highest effluent concentration tested; used sea salts
- Randy Baker asked if other mines are doing the salinity adjustment. Sandra B indicated that for marine tests the standard protocol is to adjust salinity.
- Note: Only one effluent collection for SLTT was done. The mine discharged for approximately 9 weeks.

Slides 10 & 11 – Effluent Characterization - Sublethal Toxicity Testing
- Think Zinc was the cause of the toxicity. Paired samples - one for toxicity and one for chemistry.
- Arctic amphipods used by Peter Chapman were collected from discharge environment. Temperature known to affect toxicity. The higher the temperature, the higher the toxicity.

Slide 12 to 13 - Reconnaissance Studies in Garrow Bay
- 16' boat, rifle, communications – radio to mine
- Plume Delineation was done using a boat and chest-waders

Slide 14 to 20 – Plume Delineation
- Chest waders and boat survey, working from outside in
- Field measurements taken of temperature, salinity and zinc concentration
- Samples collected at surface (top 30 cm) and subsurface (10 cm off bottom)
- Effluent was 40 cm 'thick' at mouth of Garrow Creek and decreased to 10 to 20 cm 'thick' 200 m offshore
- At about 25 to 26 ppt salinity, Zinc was down to 0.05 mg/L (detection limit)
- Negative regression between zinc concentration and salinity
- Ice present in bay really accelerates mixing process as plume moves around and under ice blocks.

Slide 21 Modeling - Frick *et al.* 2003 EPA visual plumes software
- Wind and current influences mixing.
- No ice involved in model
- In the future, discharge will be approximately 1/5 to 1/10 of what it was in 2003

Slide 27 – 2003 Reconnaissance Design

- Had planned to use Tigumiavik Harbour as a reference area, but access was too difficult.
- Reference was moved to approximately 500 m north of Garrow Creek mouth, based on results of plume delineation.
- Water Quality Monitoring as well as sediment and clam tissue data indicate background conditions.

Slide 28
- Previous surveys, clams collected under ice but tried to get clams from closer to the creek mouth this time using divers. Intertidal area devoid of life except for amphipods.
- 2 reference areas, one for intertidal and one for sub-tidal, access limited.
- Plume moved both ways, went far enough away north/south to be out of the plume. Also suspected a back eddy but wind a bigger issue.
- Three exposure stations sampled & 1 reference– were limited by divers and clams.

Slide 30
- Prawn trap was baited with cat food. Worked very well in Garrow Lake when baited with cat food. Tried in marine environment – amphipods ate cat food. Was crushed by ice on second night.
- Clams – composited 3 to 4 clams per size category and analyzed composite.

Slide 31
- N=3 means 3 composite samples each comprised of 3 to 4 clams
- Metal suite on body tissue
  - Intended to depurate but not enough clams
  - Pulled them out, put them in bags, scrubbed them in lab, pulled siphon and cleaned as best as could
  - Results include everything: siphon, sediment, gut contents, etc.
- No relationship between size and metal concentration

Slide 32 – Historical Metals Concentrations in Clam Tissue
- Fallis' historical clam data was on depurated clams. Sample size is number of composites in all cases except for BC research who analyzed individual clams.

Slide 34 – Sediment Survey
- Unable to collect sediment with standard Ponar grab
- Recovered kelp on gravel most times in spaces allowed for water movement
- Rate of failure consistent between near-field, far-field and ref area

Slide 35 – Metal Concentrations in Sediment 2003
- Intertidal concentrations higher than sub-tidal concentrations.

- Did analysis on 2mm (sand) fraction and down. In both subtidal and tidal targeted fine sediments.
- Note: likely the first metals data for intertidal sediment collected at this site.

Four options raised for discussion:

- conduct an EEM compliant study design
  - consultants don't think this can be done
- conduct a limited field study using alternative tools
  - diver assisted clams and sediment
    - underwater imagery (SIMS)
    - F&O Canada requires SIMS for intertidal areas by barge
- No further biological monitoring
  - Continue effluent and water quality monitoring
- Other?

Donald Bruce KIMB

From: Donald Bruce KIMB
Sent: August 18, 2004 3:59 PM
To: 'Blenkinsopp,Sandra [Edm]'
Cc: 'Beth Power'
Subject: Polaris EEM Program Update

I just got a call from Randy Baker via the satellite phone from site. The phone system at site is not demolished (and thus no email either) along with the Accommodation Building (so the crews are now living in Sea Containers and Trailers in the temporary camp). The satellite phones do not have good connections and the signal is often distorted. The connection breaks off frequently so they need to call back two or more times to accomplish a 5 minute call.

The 3 Azimuth scientists and the two divers they contracted are on site now. They arrived August 14th as planned. They have all their gear mobilized including the sampling equipment and bottles. We have left a rental compressor on site for the divers (they have to fill their bottles on site as can't ship them full on the airlines). They have set up a tent for shelter by the bay (for the divers) and we have assigned them access to quads for transportation as well as two boats. We purchased one of the boats specifically the EEM program and flew it in during the winter so that they would have a second boat as a safety back up. The winds in Garrow Bay can get fairly strong so we need to be able reach them incase they run into trouble in the first boat. Last year we used an older boat as the backup but it is not adequate for safety and we should have had something more reliable last year. They have the SIMS gear on site with them as well, so are ready to do the video survey.

Randy asked that I pass on to you that they are currently waiting for the ice to free up in Garrow Bay. Last year the ice was off the bay at this time. Randy is concerned that the ice may not leave the bay this year. As we committed, we are having them remain on site for two weeks incase the ice is just a bit later leaving this year. We mutually agreed with Environment Canada that a two week period was as an acceptable level of effort. Hopefully we get a strong wind that frees the ice so we can complete the planned work program.

For your information, we collected our monthly water samples from Garrow Creek yesterday as well as the sub-acute samples. However, it was foggy today so the plane from Resolute was unable to come into site but it didn't really matter as it doesn't look like the commercial flights could make it into Resolute today either. There is a slim chance the weather may change and the plane will try later today but it is a slim chance. Will try to sample again if it looks like the flight can get in tomorrow. If there isn't a flight tomorrow, then we'll try again next Tuesday.

Randy will try to give you a call in a few days to update you directly.
I am in contact with the site on a regular basis incase you want to pass any messages onto them.

Regards,
Bruce Donald

Donald Bruce KIMB

From: Blenkinsopp,Sandra [Edm] [Sandra.Blenkinsopp@EC.gc.ca]
Sent: August 18, 2004 4:24 PM
To: Donald Bruce KIMB
Subject: RE: Polaris EEM Program Update

Thanks for the update Bruce!

-----Original Message-----
From: Donald Bruce KIMB [mailto:bruce.donald@teckcominco.com]
Sent: Wednesday, August 18, 2004 3:59 PM
To: Blenkinsopp,Sandra [Edm]
Cc: Beth Power
Subject: Polaris EEM Program Update

I just got a call from Randy Baker via the satellite phone from site. The phone system at site is not demolished (and thus no email either) along with the Accommodation Building (so the crews are now living in Sea Containers and Trailers in the temporary camp). The satellite phones do not have good connections and the signal is often distorted. The connection breaks off frequently so they need to call back two or more times to accomplish a 5 minute call.

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I am in contact with the site on a regular basis incase you want to pass any messages onto them.

Regards,
Bruce Donald

Donald Bruce KIMB

From: Blenkinsopp,Sandra [Edm] [Sandra.Blenkinsopp@EC.gc.ca]
Sent: August 20, 2004 12:51 PM
To: Donald Bruce KIMB
Subject: RE: Garrow Bay
Attachments: 20082004_IMAGE121.jpg

Hi Bruce

Here is the info that the weather office obtained from the Canadian Ice Service. I have an interpretation of the image from the sea ice service, but it was done on the assumption that Garrow Bay was on the northern end of the island. I have gone back to them for another interpretation.

S

-----Original Message-----
From: Donald Bruce KIMB [mailto:bruce.donald@teckcominco.com]
Sent: Thursday, August 19, 2004 3:32 PM
To: Blenkinsopp,Sandra [Edm]
Subject: RE: Garrow Bay

That would be appreciated. The ice has gone out in the adjacent bay but it always goes out first as it is more exposed and is a slightly different shape.
…bruce

From: Blenkinsopp,Sandra [Edm] [mailto:Sandra.Blenkinsopp@EC.gc.ca]
Sent: August 19, 2004 3:18 PM
To: Donald Bruce KIMB
Subject: Garrow Bay

Hi Bruce

I've spoken with the weather office staff (MSC) in our building and asked them to try to get some detailed info on the ice conditions in the area of Garrow Bay. If I find out anything that looks useful I'll pass it on.

S

APPENDIX 20

GARROW LAKE EFFLUENT DISCHARGE

MONITORING DATA

Bruce J. Donald
Reclamation Manager

March 31, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – 2003 ANNUAL Metal Mining Effluent Regulations Summary Report

Please find attached a **revised** Polaris Mine annual MMER summary report as the original report submitted January 27, 2004 was not complete and contained errors. There were no non-compliant concentrations related to Schedule 4 limits and no non-compliant results of the acute lethality tests during the year.

The following is included in our revised 2003 Annual Submission:

1. Requirements under Schedule 6
   - Identification of Site, Owner, Location, etc.
   - Non-Compliance information
   - Table 1 – Monthly Mean Concentrations, pH Range and Volume of Effluent
   - Table 2 – Results of Acute Lethality Tests and Daphnia Magna Monitoring Tests

2. Requirements under Part 1 Section 8
   - Results of studies conducted under Part 1, Section 4 (Effluent Characterization)
   - Results of studies conducted under Part 1, Section 5 (Sublethal Toxicity Testing)
   - Part 1, Section 6 Required Frequency of Effluent Characterization
   - Results of studies conducted under Part 1, Section 7 (Water Quality Monitoring)

During 2003, Teck Cominco conducted only one series of sublethal effluent testing in error contrary to the requirements of Part 1, Section 6 of the MMER. The report contains a letter from our consultants explaining the error. Teck Cominco intends to comply with section of the regulations as part of our monitoring program planned for 2004 and 2005.

The monitoring data required to be reported in electronic format has been emailed to you along with an electronic copy of this report (emailed March 31, 2004).

Please note that the location of the final discharge point previously submitted had a typographical error which has been corrected in this report.

If you have any questions regarding the annual report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me at any time.

Yours truly,

Original signed by B. Donald
Bruce Donald

Attachments: Revised 2003 MMER Annual Report
cc: Walter Kuit (Teck Cominco Limited)
Joe Dahoy (Cascade Management)
Patrick Allard (Azimuth Consulting Group)

SCHEDULE 6

(Section 22)

SCHEDULE 6

(Section 22)

Mine Name : Polaris Mine

Mine Operator: Cominco Mining Partnership and Teck Cominco Ltd.

Mine Address: Box 188, Resolute, NU X0A 0B0

Telephone: (867) 253-2201 (Site Manager, Joe Dahoy)

E-mail: joe.dahoy@teckcominco.com

Location of Final Discharge Point:
Garrow Lake Siphons at 75^0 22' 32" N, 96^0 48' 37" W.

Reporting Period: January 1, 2003 to December 31, 2003

Date of Report: **Revised** March 31, 2003

Non-Compliance Information:

There were no non-compliant effluent discharges during 2003. All effluent sample results were within Schedule 4 limits.

There were no non-compliant acute lethality tests during 2003.

SCHEDULE 6

TABLE 1

MONTHLY MEAN CONCENTRATIONS, pH RANGE AND VOLUME OF EFFLUENT (1)(2)

MONTH	As (mg/L)	Cu (mg/L)	CN (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	TSS (mg/L)	Ra (Bq/L)	pH	Effluent Volume (m^3)
January	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
February	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
March	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
April	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
May	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
June	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
July	0.000	0.001	0.005	0.006	0.001	0.055	3.00	0.005	7.77 - 7.84	1,555,704
August	0.001	0.001	0.005	0.001	0.002	0.137	4.25	0.005	7.85 - 8.10	2,909,048
September	0.001	0.001	0.005	0.002	0.003	0.165	8.67	0.007	7.94 - 8.06	2,824,710
October	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
November	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]
December	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]	ND[1]

Note [1] - "ND" refers to any measurement not taken because there was no deposit from the final discharge point.

Note [2] - "NMR" refers to any measurement not taken because no measurement was required in accordance with the conditions set out in Section 13 of the regulations.

SCHEDULE 6
TABLE 2

RESULTS OF ACUTE LETHALITY TESTS AND DAPHNIA MAGNA MONITORING TESTS

DATE SAMPLE COLLECTED	EFFLUENT ACUTELY LETHAL TO RAINBOW TROUT (Yes or No)	EFFLUENT ACUTELY LETHAL TO DAPHNIA MAGNA (Yes or No)
30-Jul-03	No	No
20-Aug-03	No	No
16-Sep-03	No	No

REQUIREMENTS UNDER SECTION 4 OF PART 1

EFFLUENT CHARACTERIZATION

Monthly Sampling of Effluent in Garrow Creek for EEM

(Lat 75°22'32", Long 96°48'37")

	Conventional Water Chemistry and Water Quality Parameters									
Sample Date	Lab pH	Field pH	Field Temperature	Dissolved Oxygen	Hardness	Alkalinity	Ammonia	Cyanide	Nitrate	TSS
2003-07-29	7.84	7.69	0.30	10.53	459	46	0.08	*0.005*	0.102	*3*
2003-08-19	8.10	8.70	1.22	4.94	1130	103	0.03	*0.005*	0.225	8
2003-09-16	7.96	8.75	0.19	3.95	1540	122	0.04	NA	0.217	5

	Dissolved Metal Concentrations										
Sample Date	Aluminum	Cadmium	Iron	Mercury	Molybdenum	Arsenic	Copper	Lead	Nickel	Zinc	Radium ^{226}
2003-07-29	*0.1*	0.00016	0.02	*0.00005*	*0.002*	*0.0004*	0.00057	0.00319	0.00115	0.0625	*0.005*
2003-08-19	*0.1*	0.00037	0.03	*0.00005*	*0.002*	*0.0010*	0.00097	0.00046	0.00265	0.1460	*0.005*
2003-09-16	*0.1*	0.00047	0.04	*0.00005*	*0.005*	*0.0010*	0.00099	0.00046	0.00365	0.1860	*0.005*

NA - Not Available (no sample).

Note[1] - All concentrations are in mg/L, except pH which is in pH units and temperature which is in °C

Concentrations in *red italics* were set to the detection limit.

POLARIS MINE ANNUAL MMER REPORT

REQUIREMENTS UNDER SECTION 5, PART 1

APPENDIX A

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPAW 95-EPA West Coast: 7-day Topsmelt Survival and Growth Test.

APPENDIX B

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPS 1/Rm/27-EC: 92 hr Echinoderm (sand dollar) Fertilization Test (Annual)

APPENDIX C

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPA/600/4-91-003, Method 1009.0: Algae (*Champia parvula*) 7-day Sublethal Growth Test (Annual).

APPENDIX A

7-d Topsmelt Growth and Survival Toxicity Test

Reporting Requirements for Reference Method EPA/600/R-95/136

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

Test Organisms Imported from External Supplier

i. Species of test organism
   - Topsmelt (*Atherinops affinis*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Aquatic Bio Systems (ABS), Fort Collins, Colorado

iv. Date test species acquired on
   - August 21, 2003

v. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vi. Percent mortality of fish in 24-hour period preceding the test
   - <10% mortality

vii. Age at start of test
   - 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
   - Nothing unusual, no excessive crowding of larvae, larvae appear healthy, disease-free, stress free,

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
   - Larvae actively feeding and swimbladders not inflated

x. Confirmation that temperature change was <3°C and dissolved oxygen was maintained at >6mg/L during transport
   - Temperature change was <2°C and dissolved oxygen supersaturated mg/L during transport

xi. Test organism acclimation rate at the testing laboratory
   - Holding water conditions upon arrival were DO=supersaturated, pH=7.3, T=22°C
   - Organisms were acclimated slowly overnight
   - Addition of EVS lab seawater at intervals of 30 – 60min to reach acceptable conditions
   - Organisms were acclimated to DO=8mg/L, salinity=28ppt,T=20°C

Reporting Requirements for Reference Method EPA/600/R-95/136

Test Facilities and Conditions

i. Test type & method
   - 7-day Topsmelt (*Atherinops affinis*) Survival and Growth Toxicity Test
   - Static renewal
   - Sample water was renewed daily
   - Reference Method - EPA/600/R-95/136 (EPAW 95-EPA West Coast)

ii. Indications of deviations from requirements in Sections 11 of Method EPA/600/R-95/136 (EPAW 95-EPA West Coast)
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 5.3ppt

iii. Date and time for start of definitive test
   - Friday August 22, 2003 - 5:00 PM

iv. Test vessel description
   - 600mL beaker

v. Person(s) performing the test and verifying the results
   - Kevin Goodearle, Julianna Kalocai, Sioe Lie Kwee, Rachel DeWynter, Edmund Canaria, and Armando Tang

vi. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - pH - 7.9, T - 20.0°C, DO - 11.0mg/L, C - 9570µmhos/cm, (salinity - 5.3 ppt)

vii. Confirmation that no adjustment of sample or solution pH occurred
   - No pH adjustment

viii. Indication of aeration of test solutions before introduction of fish
   - Pre-aeration at 6.5mL/min/L for 30mins due to supersaturation of sample with O_2 when sample was heated to 20°C
   - DO was reduced from 11.0mg/L to 7.8 mg/L

ix. Indication that EC guidance document for salinity adjustment was followed
   - No deviations from EC guidance document on preparation of hypersaline brine
   - HSB prepared from natural seawater concentrated to 90ppt (by freezing/refreezing to remove frozen layer and concentrate salts)
   - No deviations from EC guidance document for salinity adjustment of sample
   - HSB was added to samples to salinity adjust them from 5.3ppt to 30ppt

x. Type and source of control/dilution water
   - UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xi. Concentrations and volumes tested
   - Concentrations (% effluent volume / total volume) tested and total volumes used were:
   - Control (0%) - 200 mL
   - Salinity Control (0%) - 200 mL
   - 4.5% - 200mL
   - 9.0% - 200mL
   - 18.1% - 200mL
   - 36.2% - 200mL
   - 72.3% - 200mL

xii. Number of replicated per concentration
   - 5 replicates per concentration

xiii. Number of organisms added to each test vessel
   - 5 fish per vessel

xiv. Manner and rate of exchange of test solutions
   - Daily renewal

Reporting Requirements for Reference Method EPA/600/R-95/136

xv. Measurements of dissolved oxygen, pH and temperature
- DO: 6.6 - 7.8 mg/L, pH: 7.7 - 8.2, T: 19.0 - 20.0 °C, salinity: 29 - 31 ppt

Results

i. Number and % of mortalities of fish in each test solution
- Totals from all 5 replicates are presented:
- Control (0%) - 1/25 = 4%
- Salinity Control - 0/25 = 0%
- 4.5% - 0/25 = 0%
- 9.0% - 0/25 = 0%
- 18.1% - 0/25 = 0%
- 36.2% - 0/25 = 0%
- 72.3% - 1/25 = 4%

ii. Average dry weight per original fish in test vessel
- Means from all 5 replicates are presented:
- Control (0%) - 1.18 mg
- Salinity Control - 1.14 mg
- 4.5% - 1.13 mg
- 9.0% - 1.32 mg
- 18.1% - 1.09 mg
- 36.2% - 1.11 mg
- 72.3% - 1.14 mg

iii. Estimate of 7-d LC_{50} (95% CL)
- 7-d LC_{50} concentration > 72.3% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

iv. Estimate of 7-d IC_{25} (95% CL) for growth
- 7-d IC_{25} concentration > 72.3% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth
- Reference toxicity tests for Toxicant: Copper
- Test conducted on August 22, 2003, same day as effluent test
- Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
- 7-d LC_{50} survival = 122mg/L Cu, 95% CL = 111-135mg/L
- 7-d IC_{50} growth = 122mg/L Cu, 95% CL = 106-132mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth
- Reference toxicity tests for Toxicant: Copper
- 7-d LC_{50} survival = 139 ± 63mg/L Cu,
- 7-d IC_{50} growth = 136 ± 52mg/L Cu

APPENDIX B

92-h Echinoderm Fertilization Test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

Test Organisms

i. Species of test organism
   - Sandollar Echinoid (*Dendraster excentricus*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - M-REP, Escondido, California
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - August 22, 2003

v. Holding time and conditions for adults
   - Adults received at the testing laboratory the day of the test, shipped overnight

vi. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vii. Weekly percent mortality of adults being held over 7d preceding test
   - <2% per day over the 7 days preceding the test

viii. Age of test organisms
   - < 4 hours after spawning

ix. Unusual appearance, behaviour, or treatment of adults or gametes before test start
   - Organisms appear healthy

Test Facilities and Conditions

i. Test type & method
   - Echinoderm (*Dendraster excentricus*) Fertilization Toxicity Test
   - Static
   - Reference Method – EPS/1/RM/27 with 1997 amendments

ii. Test duration
   - 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Friday August 22, 2003 - 5:00 PM

iv. Test vessel description
- 16 x 125mm test tubes

v. Person(s) performing the test and verifying the results
- Kevin Goodearle, Julianna Kalocai, Sioe Lie Kwee, Rachel DeWynter, Edmund Canaria, and Armando Tang

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- No pre-aeration

vii. Confirmation that no adjustment of sample or solution pH occurred
- No pH adjustment

viii. Procedure for sample filtration
- No sample filtration

ix. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment
- Salinity adjusted from 5ppt to 29ppt

xi. Type and source of control/dilution water
- UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xii. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 10mL
- Salinity Control (0%) - 10mL
- 4.6% - 10mL
- 9.1% - 10mL
- 18.2% - 10mL
- 36.5% - 10mL
- 73.0% - 10mL

xiii. Number of replicated per concentration
- 4 replicates per treatment concentration

xiv. Number of organisms per container
- 2000 eggs per 10mL vessel

xv. Measurements of pH and dissolved oxygen in sample water before use
- pH - 8.3, DO - 8.4mg/L

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- pH - 7.9-8.4, T - 15.0-15.5°C, DO - 8.1-8.4mg/L, salinity - 29ppt

Results

i. Number and % of fertilized eggs in each test concentration
- (Number is equal to percent since totals were 100)
- Control (0%): #F = 51, 50, 52, 54 #UF = 49, 50, 49, 46
- Salinity Control: #F = 51, 52, 50, 51 #UF = 49, 48, 50, 49
- 4.6%: #F = 35, 40, 29, 45 #UF = 65, 60, 71, 55
- 9.1%: #F = 36, 28, 33, 25 #UF = 64, 72, 67, 75
- 18.2%: #F = 22, 24, 18, 20 #UF = 78, 78, 82, 80
- 36.5%: #F = 12, 8, 7, 10 #UF = 88, 92, 93, 90
- 73.0%: #F = 1, 0, 2, 0 #UF = 99, 100, 98, 100

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

ii. Estimate of IC_{25} (95% CL) for fertilization success
- IC_{25} concentration = 3.8 (1.1 - 7.2)% v/v effluent
- Quantal statistic method = log linear interpolation

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization
- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test conducted on August 22, 2003, same day as effluent test
- Reference test conducted under same conditions
- IC_{50} for fertilization = 1.3mg/L SDS, 95% CL = 1.1-1.5mg/L

APPENDIX C

7-d Sublethal *Champia* (Algae) Toxicity Test

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Wednesday August 20, 2003 - 12:30 AM

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 1 x 4L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee)

vii. Temperature of water upon receipt at lab
   - 13°C

Test Organisms

i. Species of test organism
   - Algae (*Champia parvula*)

ii. Name and city of testing laboratory
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species
   - Sexually mature male and female branches
   - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
   - Appear in good health
   - Females have trichogynes, males have sori with spermatia

Test Facilities and Conditions

i. Test type & method
   - *Champia parvula* sexual reproduction test
   - Static, non-renewal
   - 2-day exposure, followed by 5-7 day recovery period for cystocarp development
   - Reference Method - EPA/600/4-91/003, Method 1009.0

ii. Date and time for start of definitive test
   - Friday August 22, 2003 – 10:00 AM

iii. Test vessel description
   - 270mL transparent polystyrene cups with polystyrene lids

iv. Person(s) performing the test and verifying the results
   - Mary Moody

v. Indication of pre-aeration of test solutions
   - No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
   - No pH adjustment

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

vii. Indication that EC guidance document for salinity adjustment was followed
- No deviations from EC guidance document on preparation of hypersaline brine
- HSB prepared from natural seawater at 90ppt
- No deviations from EC guidance document for salinity adjustment of sample
- Salinity adjustment: 642mL effluent + 258mL HSB + 9mL test nutrient solution
- Salinity of samples adjusted from 5ppt to 30ppt

viii. Type and source of control/dilution water
- Natural seawater collected at the Pacific Environmental Center, Environment Canada, North Vancouver, BC
- Filtered to 0.2µm and autoclaved prior to use
- Salinity adjusted as per EC guidance document to 30ppt with HSB from the same source

ix. Concentrations and volumes of test solutions
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
- Salinity Control Brine (0%) - 100mL, 4.5cm depth
- 4.5% - 100mL, 4.5cm depth
- 8.9% - 100mL, 4.5cm depth
- 17.8% - 100mL, 4.5cm depth
- 35.6% - 100mL, 4.5cm depth
- 71.3% - 100mL, 4.5cm depth

x. Number of replicated per concentration
- 3 replicates per concentration

xi. Number of organisms per test chamber
- 5 female branches + 2 male branches per chamber

xii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use
- pH - 7.93, T - 23.5°C, DO - 9.4mg/L, salinity - 5ppt

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample during test
- DO: 7.8 - 8.0 mg/L, pH: 7.74 - 8.98, T: 23°C, salinity: 30ppt

Results

i. Number and % mortality of female plants after recovery in each test solution
- Totals from all 3 replicates are presented:
- Control (0%): 0 (0%) mortality
- Salinity Control (0%): 0 (0%) mortality
- 4.5%: 0 (0%) mortality
- 8.9%: 0 (0%) mortality
- 17.8%: 0 (0%) mortality
- 35.6%: 0 (0%) mortality
- 71.3%: 0 (0%) mortality

ii. Mean number of cystocarps per plant in each test concentration
- Control (0%): 57.4; 49.6; 44.2
- Salinity Control (0%): 66.4; 44.0; 45.2
- 4.5%: 52.2; 51.4; 57.4
- 8.9%: 61.2; 63.6; 41.2
- 17.8%: 30.4; 34.4; 18.6
- 35.6%: 6.6; 6.0; 7.6
- 71.3%: 0.0; 2.4; 1.4

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

iii. Estimate of IC_{25} (95% CL) for cystocarp development
- IC_{25} concentration = 13.6 (9.0-16.0)% effluent v/v
- Quantal statistic method was linear interpolation

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development
- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test conducted on July 29, 2003, within 30 days of effluent test
- Reference toxicant test was conducted under the same experimental conditions as the effluent test
- IC_{50} cystocarp development = 1.19mg/L SDS, 95% CL = 1.14-1.23mg/L

v. Reference toxicity warning limits (+/- 2SD) for IC_{50} for cystocarp development
- Reference toxicity tests for Toxicant: SDS
- 7-d IC_{50} growth = 1.47 (1.17-1.84) mg/L SDS

REQUIREMENTS UNDER SECTION 6 OF PART 1

SUBLETHAL TOXICITY TESTING FREQUENCY

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC V6K 2G8

Phone: 604-730-1220
Fax: 604-739-8511

Our File #: TC-03-03

March 18, 2004

Sidney F. Bruinsma
Enforcement/Emergencies Officer, Nunavut
Northern Division, Environmental Protection Branch
Environment Canada
Box 1870, Iqaluit
Nunavut X0A 0H0

Dear Mr. Bruinsma:

Re: Polaris Mine EEM – Missed Sublethal Toxicity Test Sampling Event

Further to our recent discussion, we are pleased to document the issues and circumstances surrounding the missed 2003 sampling event for sublethal toxicity testing (SLTT) of effluent at Teck Cominco's Polaris Mine.

First, Azimuth Consulting Group (Azimuth) takes full responsibility for the missed sampling event, which resulted from an oversight on our part. Our staff have considerable experience conducting environmental effects monitoring (EEM) programs under the Pulp and Paper Effluent Regulations (PPER), which have been in place for some years. We understand the importance of the SLTT as an EEM investigative tool and would not knowingly miss a sampling event. The oversight comes from our interpretation of the new Metal Mining Effluent Regulations (MMER) and how they apply to the Polaris Mine, which has a unique discharge situation (i.e., limited to approximately 60 days per calendar year). Under both the PPER and MMER, two sampling events are required for the SLTT. However, if the discharge period is less than 120 days, the PPER require only one sampling event. We mistakenly assumed that these terms would also apply to the MMER, which provide less detail pertaining to the requirements of this test than the PPER. This issue was compounded by the unique discharge characteristics and receiving environment of the Polaris Mine, which make the MMER more difficult to interpret and apply compared to mines discharging under more usual conditions.

We became aware of the missed SLTT event during a December 2003 workshop intended to present results of 2003 reconnaissance studies carried out at the mine and to seek feedback from the Technical Advisory Committee (TAP) on our proposed study design for the Polaris Mine. Following our presentation, Ms. Sandra Blenkinsopp pointed out that two sampling events were indeed required under MMER. She then indicated that Environment Canada would contact us to further discuss the implications of this matter.

We agree that the missed SLTT event is unfortunate and will ensure that this test is carried out twice during the 2004 and 2005 discharge periods.

Please do not hesitate to contact us if you have any questions or require further clarification.

Sincerely,

Azimuth Consulting Group Inc.

Patrick Allard, M.Sc., R.P.Bio.

cc: Randy Baker (Azimuth)
Bruce Donald (Teck Cominco)

REQUIREMENTS UNDER SECTION 7 OF PART 1

WATER QUALITY MONITORING

Monthly Sampling of Exposure Station in Garrow Bay at mouth of Garrow Creek

(Lat 75°22'15", Long 96°48'30")

	Conventional Water Chemistry and Water Quality Parameters									
Sample Date	Lab pH	Field pH	Field Temperature	Dissolved Oxygen	Hardness	Alkalinity	Ammonia	Cyanide	Nitrate	TSS
2003-07-29	7.86	7.75	0.47	10.29	456	46	0.04	*0.005*	0.098	4
2003-08-19	8.13	8.36	1.08	5.01	1120	104	0.03	*0.005*	0.229	8
2003-09-16	7.85	8.38	-0.76	5.45	3620	117	0.03	*0.005*	0.159	10

	Dissolved Metal Concentrations										
Sample Date	Aluminum	Cadmium	Iron	Mercury	Molybdenum	Arsenic	Copper	Lead	Nickel	Zinc	Radium ^{226}
2003-07-29	*0.1*	0.00015	0.03	*0.00005*	*0.002*	*0.0004*	0.00080	0.00435	0.00121	0.0594	*0.005*
2003-08-19	*0.1*	0.00038	0.05	*0.00005*	*0.002*	*0.001*	0.00106	0.00108	0.00304	0.1490	*0.005*
2003-09-16	*0.1*	0.00024	0.03	*0.00005*	0.006	0.001	0.00059	0.00043	0.00169	0.0881	0.005

Note[1] - All concentrations are in mg/L, except pH which is in pH units, Radium ^{226} which is in Bq/L and temperature which is in °C

Concentrations in *red italics* were set to the detection limit.

Monthly Sampling of Reference Station in Garrow Bay (1 km NE of Exposure Station)

(Lat 75°22'40", Long 96°47'12")

	Conventional Water Chemistry and Water Quality Parameters									
Sample Date	Lab pH	Field pH	Field Temperature	Dissolved Oxygen	Hardness	Alkalinity	Ammonia	Cyanide	Nitrate	TSS
2003-07-29	7.67	7.13	-0.27	9.27	989	33	0.03	*0.005*	*0.005*	*3*
2003-08-19	7.87	8.32	0.18	5.50	5830	115	*0.02*	*0.005*	*0.005*	32
2003-09-16	7.78	8.35	-1.36	3.42	5930	113	0.08	*0.005*	*0.005*	9

	Dissolved Metal Concentrations										
Sample Date	Aluminum	Cadmium	Iron	Mercury	Molybdenum	Arsenic	Copper	Lead	Nickel	Zinc	Radium ^{226}
2003-07-29	*0.1*	*0.00002*	0.01	*0.00005*	*0.002*	*0.0004*	0.00023	0.00032	0.00021	0.0010	*0.005*
2003-08-19	*0.1*	0.00003	*0.01*	*0.00005*	0.010	0.0020	0.00044	0.00021	0.00033	0.0007	*0.005*
2003-09-16	*0.1*	0.00003	0.02	*0.00005*	0.011	*0.0010*	0.00028	0.00052	0.00026	0.0011	*0.005*

Note[1] - All concentrations are in mg/L, except pH which is in pH units, Radium ^{226} which is in Bq/L and temperature which is in ^{o}C

Concentrations in *red italics* were set to the detection limit.

Bruce J. Donald
Reclamation Manager

May 13, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – 2004 1st Quarter Metal Mining Effluent Regulations Report

Despite having a designated discharge location for effluent identified under Section 9 of the MMER, there was no discharge from the Garrow Lake Tailings Impoundment Area during the period January 1, 2004 to March 31, 2004. While there is no data to report, I have completed the monitoring report as required by the regulations and have attached it to this letter.

If you have any questions regarding the quarterly report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me at any time.

Yours truly,

Bruce Donald

Attachments: 1st Quarter 2004 Monitoring Report

cc:
Walter Kuit (Teck Cominco Limited)
Polaris Mine Site Files
Randy Baker (Azimuth Consulting Group)

POLARIS MINE – MMER MONITORING REPORT

1st QUARTER 2004

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14

APPENDIX C

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX D

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

Reporting Requirements for Reference Method EPS 1/RM/13

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Percent mortality of fish in stock tank(s)
   - None to report. There were no tests conducted during the period

v. Species of test organism
   - None to report as there were no tests conducted during the period

vi. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vii. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

ix. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

x. Indication of aeration of test solutions before introduction of fish
   - None to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Number of fish added to each test vessel
   - No fish added as there were no tests conducted during the period

xiv. Mean and range of fork length of control fish at end of test
   - No data to report as there were no tests conducted during the period

xv. Mean wet weight of individual control fish at end of the test
   - No data to report as there were no tests conducted during the period

xvi. Estimated loading density of fish in test solutions
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/13 - Continued

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
   - None to report. No tests conducted during the period

ii. Number of control fish showing atypical/stressed behaviour
   - None to report. No tests conducted.

iii. Mean mortality rate in solutions of effluent and control water
   - None to report. No tests conducted

iv. Estimate of 96-h LC50 in multi-concentration tests
   - No data to report. No tests conducted

v. Most recent 96-h LC50 for reference toxicity test(s)
   - No data to report. No tests conducted

APPENDIX B

Reporting Requirements for Reference Method EPS 1/RM/14

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Species of test organism
   - None to report as there were no tests conducted during the period

v. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vi. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

viii. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

ix. Indication of any adjustment of hardness of effluent sample
   - No adjustment to report as there were no tests conducted during the period

x. Indication of any aeration of sample
   - No indication to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
   - No data to report as there were no tests conducted during the period

xiv. Number of neonates per test vessel and milliliters of solution per daphnid
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/14 - Continued

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
   - No data to report. No tests conducted during the period.

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
   - No data to report. No tests conducted during the period.

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
   - No data to report. No tests conducted during the period

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
   - No data to report. No tests conducted during the period.

APPENDIX C

2004 1st QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1]								pH[1]	Collection Method
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]		
05-Jan-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
12-Jan-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
19-Jan-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
26-Jan-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
02-Feb-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
09-Feb-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
16-Feb-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
23-Feb-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
01-Mar-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
08-Mar-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
15-Mar-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
22-Mar-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
29-Mar-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no deposit of effluent discharge to sample

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3]							
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
January/04	nd[2]	nd[2]	na[2]	na[2]	na[2]	na[2]	na[2]	nd[2]
February/04	nd[2]	n[2]	n[2]	n[2]	n[2]	n[2]	n[2]	nd[2]
March/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no deposit of effluent to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
05-Jan-04	nd[2]	0	0	0	0	0	0	0	0	0
12-Jan-04	nd[2]	0	0	0	0	0	0	0	0	0
19-Jan-04	nd[2]	0	0	0	0	0	0	0	0	0
26-Jan-04	nd[2]	0	0	0	0	0	0	0	0	0
02-Feb-04	nd[2]	0	0	0	0	0	0	0	0	0
09-Feb-04	nd[2]	0	0	0	0	0	0	0	0	0
16-Feb-04	nd[2]	0	0	0	0	0	0	0	0	0
23-Feb-04	nd[2]	0	0	0	0	0	0	0	0	0
01-Mar-04	nd[2]	0	0	0	0	0	0	0	0	0
08-Mar-04	nd[2]	0	0	0	0	0	0	0	0	0
15-Mar-04	nd[2]	0	0	0	0	0	0	0	0	0
22-Mar-04	nd[2]	0	0	0	0	0	0	0	0	0
29-Mar-04	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note[2] - "nd" refers to no deposit of effluent to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
January/04	0	0	0	0	0	0	0	0	0	0
February/04	0	0	0	0	0	0	0	0	0	0
March/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

APPENDIX D

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

No effluent samples were collected during the 1st Quarter of 2004 as there was no effluent discharge.
No Acute Lethality Testing conducted during the quarter as there was no effluent being discharged.

Bruce J. Donald
Reclamation Manager

August 11, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – 2004 2nd Quarter Metal Mining Effluent Regulations Report

Despite having a designated discharge location for effluent identified under Section 9 of the MMER, there was no discharge from the Garrow Lake Tailings Impoundment Area during the period April 1, 2004 to June 30, 2004. While there is no data to report, I have completed the monitoring report as required by the regulations and have attached it to this letter.

If you have any questions regarding the quarterly report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me at any time.

Yours truly,

Bruce Donald

Attachments: 2nd Quarter 2004 Monitoring Report

cc:
Walter Kuit (Teck Cominco Limited)
Randy Baker (Azimuth Consulting Group)

POLARIS MINE – MMER MONITORING REPORT

2nd QUARTER 2004

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14

APPENDIX C

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX D

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

Reporting Requirements for Reference Method EPS 1/RM/13

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Percent mortality of fish in stock tank(s)
   - None to report. There were no tests conducted during the period

v. Species of test organism
   - None to report as there were no tests conducted during the period

vi. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vii. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

ix. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

x. Indication of aeration of test solutions before introduction of fish
   - None to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Number of fish added to each test vessel
   - No fish added as there were no tests conducted during the period

xiv. Mean and range of fork length of control fish at end of test
   - No data to report as there were no tests conducted during the period

xv. Mean wet weight of individual control fish at end of the test
   - No data to report as there were no tests conducted during the period

xvi. Estimated loading density of fish in test solutions
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/13 - Continued

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
   - None to report. No tests conducted during the period

ii. Number of control fish showing atypical/stressed behaviour
   - None to report. No tests conducted.

iii. Mean mortality rate in solutions of effluent and control water
   - None to report. No tests conducted

iv. Estimate of 96-h LC50 in multi-concentration tests
   - No data to report. No tests conducted

v. Most recent 96-h LC50 for reference toxicity test(s)
   - No data to report. No tests conducted

APPENDIX B

Reporting Requirements for Reference Method EPS 1/RM/14

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Species of test organism
   - None to report as there were no tests conducted during the period

v. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vi. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

viii. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

ix. Indication of any adjustment of hardness of effluent sample
   - No adjustment to report as there were no tests conducted during the period

x. Indication of any aeration of sample
   - No indication to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
   - No data to report as there were no tests conducted during the period

xiv. Number of neonates per test vessel and milliliters of solution per daphnid
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/14 - Continued

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
   - No data to report. No tests conducted during the period.

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
   - No data to report. No tests conducted during the period.

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
   - No data to report. No tests conducted during the period

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
   - No data to report. No tests conducted during the period.

APPENDIX C

2004 2nd QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
05-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
12-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
19-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
26-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
03-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
10-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
17-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
24-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
31-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
07-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
14-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
21-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
28-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
April/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
May/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
June/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
05-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
12-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
19-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
26-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
03-May-04	nd[2]	0	0	0	0	0	0	0	0	0
10-May-04	nd[2]	0	0	0	0	0	0	0	0	0
17-May-04	nd[2]	0	0	0	0	0	0	0	0	0
24-May-04	nd[2]	0	0	0	0	0	0	0	0	0
31-May-04	nd[2]	0	0	0	0	0	0	0	0	0
07-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0
14-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0
21-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0
28-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note [2] - "nd" refers to no effluent discharge to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
April/04	0	0	0	0	0	0	0	0	0	0
May/04	0	0	0	0	0	0	0	0	0	0
June/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

APPENDIX D

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

No effluent samples were collected during the 2nd Quarter of 2004 as there was no effluent discharge.
No Acute Lethality Testing conducted during the quarter as there was no effluent being discharged.

Bruce J. Donald
Reclamation Manager

August 11, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – 2004 2nd Quarter Metal Mining Effluent Regulations Report

Despite having a designated discharge location for effluent identified under Section 9 of the MMER, there was no discharge from the Garrow Lake Tailings Impoundment Area during the period April 1, 2004 to June 30, 2004. While there is no data to report, I have completed the monitoring report as required by the regulations and have attached it to this letter.

If you have any questions regarding the quarterly report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me at any time.

Yours truly,

Bruce Donald

Attachments: 2nd Quarter 2004 Monitoring Report

cc:
Walter Kuit (Teck Cominco Limited)
Randy Baker (Azimuth Consulting Group)

POLARIS MINE – MMER MONITORING REPORT

2nd QUARTER 2004

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14

APPENDIX C

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX D

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

Reporting Requirements for Reference Method EPS 1/RM/13

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Percent mortality of fish in stock tank(s)
   - None to report. There were no tests conducted during the period

v. Species of test organism
   - None to report as there were no tests conducted during the period

vi. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vii. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

ix. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

x. Indication of aeration of test solutions before introduction of fish
   - None to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Number of fish added to each test vessel
   - No fish added as there were no tests conducted during the period

xiv. Mean and range of fork length of control fish at end of test
   - No data to report as there were no tests conducted during the period

xv. Mean wet weight of individual control fish at end of the test
   - No data to report as there were no tests conducted during the period

xvi. Estimated loading density of fish in test solutions
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/13 - Continued

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
   - None to report. No tests conducted during the period

ii. Number of control fish showing atypical/stressed behaviour
   - None to report. No tests conducted.

iii. Mean mortality rate in solutions of effluent and control water
   - None to report. No tests conducted

iv. Estimate of 96-h LC50 in multi-concentration tests
   - No data to report. No tests conducted

v. Most recent 96-h LC50 for reference toxicity test(s)
   - No data to report. No tests conducted

APPENDIX B

Reporting Requirements for Reference Method EPS 1/RM/14

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Species of test organism
   - None to report as there were no tests conducted during the period

v. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vi. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

viii. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

ix. Indication of any adjustment of hardness of effluent sample
   - No adjustment to report as there were no tests conducted during the period

x. Indication of any aeration of sample
   - No indication to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
   - No data to report as there were no tests conducted during the period

xiv. Number of neonates per test vessel and milliliters of solution per daphnid
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/14 - Continued

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
   - No data to report. No tests conducted during the period.

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
   - No data to report. No tests conducted during the period.

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
   - No data to report. No tests conducted during the period

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
   - No data to report. No tests conducted during the period.

APPENDIX C

2004 2nd QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
05-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
12-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
19-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
26-Apr-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
03-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
10-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
17-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
24-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
31-May-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
07-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
14-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
21-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
28-Jun-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
April/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
May/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
June/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
05-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
12-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
19-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
26-Apr-04	nd[2]	0	0	0	0	0	0	0	0	0
03-May-04	nd[2]	0	0	0	0	0	0	0	0	0
10-May-04	nd[2]	0	0	0	0	0	0	0	0	0
17-May-04	nd[2]	0	0	0	0	0	0	0	0	0
24-May-04	nd[2]	0	0	0	0	0	0	0	0	0
31-May-04	nd[2]	0	0	0	0	0	0	0	0	0
07-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0
14-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0
21-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0
28-Jun-04	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note [2] - "nd" refers to no effluent discharge to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
April/04	0	0	0	0	0	0	0	0	0	0
May/04	0	0	0	0	0	0	0	0	0	0
June/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

APPENDIX D

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

No effluent samples were collected during the 2nd Quarter of 2004 as there was no effluent discharge.
No Acute Lethality Testing conducted during the quarter as there was no effluent being discharged.

Bruce J. Donald
Reclamation Manager

November 17, 2004

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – 2004 3rd Quarter Metal Mining Effluent Regulations Report

Please find attached the Metal Mining Effluent Report for the Polaris Mine for the 3rd Quarter of 2004. Discharge from Garrow Lake is no longer controlled by siphoning as Garrow Dam was removed earlier this year. As a result the timing of flow and a wide fluctuation in the flow rates was experienced this year. Flow initiated at the beginning of July, later than expected due to an unseasonably cold winter and spring. Flow continued through July and August.

The associated water quality sampling and environmental effects monitoring were conducted as required but with some complications. To ensure we captured two sub-lethal toxicity tests this year, we initiated testing with our first water sampling event of the season. However, on our first attempt, there were problems with the laboratory specimens (the Echinoderms were stimulated to spawn and only one of 39 partially spawned so the test was not initiated) and the Champia parvula sexual reproduction tests were not conducted due to problems at the commercial laboratory. Sandra Blenkinsopp was kept informed of these issues as they arose. We subsequently conducted two additional sub-acute toxicity tests which were successfully processed. The available results from all three sub-acute sampling events are presented in this report.

The first water sample of the discharge season taken on July 7th 2004 at the final discharge point was out of compliance with respect to Total Suspended Solids (TSS). Laboratory results indicated a TSS concentration of 117 mg/L compared to the MMER Schedule 4 limit of 30 mg/L for a single grab sample. All other Schedule 4 parameters were compliant. Concurrent with the July 7th sample, a set of monthly acute lethality samples were

also taken. The results of the acute lethality were compliant with the MMER and showed no acute toxicity to either the Rainbow Trout or the Daphnia magna (i.e. LC50s in both cases were > 100% effluent). Subsequent weekly sampling results for TSS, metals concentrations and acute toxicity results have all been compliant. Sid Bruinsma and Craig Broome were both promptly notified upon our receiving the laboratory results.

Effluent from Garrow Lake ceased flowing by mid-August but surface run off from adjacent slopes maintained water flow at the designated final discharge point into August. By August 17th there was still water at the final discharge point in a pool but the flow was too low to be measured. However, we continued to collect water samples for the remainder of August, so there are water quality results presented in the attached report until August 31, 2004 but the loading calculations are zero due to the lack of flow for the last three weekly samples. The flow conditions during August as well as their implications for effluent sampling were discussed with Environmental Canada representatives in early August.

I will forward a paper copy of this report by mail. Please contact me if there are any questions related to enclosed information.

Yours truly,
Original signed by B Donald

Bruce Donald

Attachments: 3rd Quarterly Monitoring Report

cc:
Walter Kuit (Teck Cominco Limited)
Randy Baker (Azimuth Consulting Group)

POLARIS MINE – MMER MONITORING REPORT

3rd QUARTER 2004

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13: 96 hr acute rainbow trout test

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14: 72 hr acute *Daphnia magna* test

APPENDIX C

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPAW 95-EPA West Coast: 7-day Topsmelt Survival and Growth Tests.

APPENDIX D

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPS 1/Rm/27-EC: 92 hr Echinoderm (sand dollar) Fertilization Test

APPENDIX E

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPA/600/4-91-003, Method 1009.0: Algae (*Champia parvula*) 7-day Sublethal Growth Tests

APPENDIX F (Mass Loadings)

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX G

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

96-h Acute Rainbow Trout Toxicity Test

Reporting Requirements for Reference Method EPS 1/RM/13

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75^{o} 22' 32" N, 97^{o} 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Wednesday July 7, 2004 – 2200h
   - Test 2: Tuesday July 27, 2004 – 2130h
   - Test 3: Tuesday August 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) – July 7, July 27, 2004
   - Patrick Allard (Azimuth) – August 24, 2004

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - 96-hour Rainbow Trout LC_{50}

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 7ppt (Test 1); 3ppt (Test 2), and 6ppt (Test 3)

iii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iv. Percent mortality of fish in stock tank(s)
   - Test 1: 0%
   - Test 2: 0.25%
   - Test 3: 0%

v. Species of test organism
   - Rainbow Trout (*Oncorhynchus mykiss*)

vi. Date and time for start of definitive test
   - Test 1: Monday July 12, 2004 – 1445h
   - Test 2: Sunday August 1, 2004 – 1030h
   - Test 3: Friday August 27, 2004 – 1100h

vii. Person(s) performing the test and verifying the results
   - Rachel DeWynter, Robert Harrison

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH – 8.1, T - 14.0°C, DO - 10.0mg/L, C – 11730 µS/cm
   - Test 2: pH - 7.6, T - 14.0°C, DO - 10.1mg/L, C – 4870 µS/cm
   - Test 3: pH – 7.7, T - 15.0°C, DO – 9.9mg/L, C – 7416 µS/cm

Reporting Requirements for Reference Method EPS 1/RM/13

ix. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment
- Test 3: No pH adjustment

x. Indication of aeration of test solutions before introduction of fish
- Test 1: 6.5 ± 1 mL/min/L for 30mins
- Test 2: 6.5 ± 1 mL/min/L for 30mins
- Test 3: 6.5 ± 1 mL/min/L for 30mins

xi. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 10 L (test 1&2), 12 L (test 3)
- 6.25% - 10 L (test 1&2), 12 L (test 3)
- 12.5% - 10 L (test 1&2), 12 L (test 3)
- 25% - 10 L (test 1&2), 12 L (test 3)
- 50% - 10 L (test 1&2), 12 L (test 3)
- 100% - 10 L (test 1&2), 12 L (test 3)
- Salinity Control - 10 L (test 1&2), 12 L (test 3)

xii. Measurements of dissolved oxygen, pH and temperature
- Test 1: DO: 9.3 - 10.1 mg/L, pH: 7.0 – 8.3, T: 14.0 – 16.0 °C
- Test 2: DO: 9.6 - 10.1 mg/L, pH: 6.8 - 8.3, T: 14.0 °C
- Test 3: DO: 9.1 – 10.1 mg/L, pH: 7.2 – 7.9, T: 15.0 – 16.0 °C

xiii. Number of fish added to each test vessel
- 10 fish/ vessel

xiv. Mean and range of fork length of control fish at end of test
- Test 1: 34mm (29-37)
- Test 2: 33mm (31-35)
- Test 3: 40mm (38 -44)

xv. Mean wet weight of individual control fish at end of the test
- Test 1: 0.39g (0.22-0.54)
- Test 2: 0.34g (0.29-0.42)
- Test 3: 0.45g (0.31-0.61)

xvi. Estimated loading density of fish in test solutions
- Test 1: 0.39g/L
- Test 2: 0.34g/L
- Test 3: 0.38g/L

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0
- 6.25% - 0
- 12.5% - 0
- 25% - 0
- 50% - 0
- 100% - 0
- Salinity Control - 0

Reporting Requirements for Reference Method EPS 1/RM/13

ii. Number of control fish showing atypical/stressed behaviour
- None in Test 1, Test 2, or Test 3

iii. Mean mortality rate in solutions of effluent and control water
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0%
- 6.25% - 0%
- 12.5% - 0%
- 25% - 0%
- 50% - 0%
- 100% - 0%
- Salinity Control - 0%

iv. Estimate of 96-h LC50 in multi-concentration tests
- Results were the same for Test 1, Test 2, and Test 3
- 96hr LC_{50} concentration > 100% effluent

v. Most recent 96-h LC50 for reference toxicity test(s)
- Reference toxicity tests for Toxicant: SDS
- Test 1: (Jun-21-04) 96-h LC_{50} = 23mg/L SDS, 95% CL = 20 - 25mg/L
- Test 2: (Jul-23-04) 96-h LC_{50} = 21mg/L SDS, 95% CL = 17 - 26mg/L
- Test 3: (Aug-27-04) 96-h LC_{50} = 38mg/L SDS, 95% CL = 33 - 44mg/L

APPENDIX B

72-h Acute *Daphnia magna* Toxicity Test

Reporting Requirements for Reference Method EPS 1/RM/14

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Wednesday July 7, 2004 – 2200h
   - Test 2: Tuesday July 27, 2004 – 2130h
   - Test 3: Tuesday August 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee), Test 1 & 2
   - Patrick Allard (Azimuth), Test 3

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - 48-hour *Daphnia magna* LC_{50}

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements
   - Salinity controls were run
   - Sample water salinity was 7ppt (Test 1); 3ppt (Test 2), and 6ppt (Test 3)

iii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iv. Species of test organism
   - *Daphnia magna*

v. Date and time for start of definitive test
   - Test 1: Sunday July 11, 2004 – 1400h
   - Test 2: Friday July 30, 2004 – 1400h
   - Test 3: Friday August 27, 2004 – 1100h

vi. Person(s) performing the test and verifying the results
   - Armando Tang, Rachel DeWynter

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.8 – 7.9, T - 20.0 – 22.0 °C, DO – 9.1 – 11.4mg/L, C - 11850µhos/cm
   - Test 2: pH - 7.8 – 8.0, T – 21.5 – 22.0 °C, DO - 8.8 – 12.1mg/L, C - 5020µhos/cm
   - Test 3: pH – 7.8 - 8.1, T – 22.0 – 23.0 °C, DO - 8.7 – 10.2mg/L, C - 9320µmhos/cm

viii. Confirmation that no adjustment of sample or solution pH occurred
   - Test 1: No pH adjustment
   - Test 2: No pH adjustment
   - Test 3: No pH adjustment

Reporting Requirements for Reference Method EPS 1/RM/14

ix. Indication of any adjustment of hardness of effluent sample
- Test 1: No hardness adjustment
- Test 2: No hardness adjustment
- Test 3: No hardness adjustment

x. Indication of any aeration of sample
- Test 1: Aeration for 9mins
- Test 2: Gentle Aeration for 10mins
- Test 3: 20mins

xi. Concentrations and volumes tested
- For all 3 Tests the concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 200 mL
    - 6.25% - 200 mL
    - 12.5% - 200 mL
    - 25% - 200 mL
    - 50% - 200 mL
    - 100% - 200 mL
    - Salinity Control - 200 mL

xii. Measurements of dissolved oxygen, pH and temperature
- Test 1: DO: 8.6 – 9.1 mg/L, pH: 7.7 – 8.2, T: 20.0 - 21.5 °C
- Test 2: DO: 8.6 - 9.1 mg/L, pH: 7.6 - 8.0, T: 20.0 - 21.5 °C
- Test 3: DO: 8.5 - 9.0 mg/L, pH: 7.6 - 8.1, T: 20.5 - 22.0 °C

xiii. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
- Test 1: 8 days to brood, 27.5 neonates/brood, 9.5% mortality in 7d prior to test
- Test 2: 7 days to brood, 24 neonates/brood, 6.0% mortality in 7d prior to test
- Test 3: 7 days to brood, 21 neonates/brood, 0% mortality in 7d prior to test

xiv. Number of neonates per test vessel and milliliters of solution per daphnid
- Methods for all tests and dilution series were the same:
- 10 neonates per vessel
- 200 mL of solution per daphnid

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
- Results were the same for Test 1, Test 2, and Test 3, except where noted
- Control (0%) - 0 dead / immobile
- 6.25% - 0 dead / immobile
- 12.5% - 0 dead / immobile
- 25% - 0 dead / immobile
- 50% - 0 dead / immobile
- 100% - 0 dead / immobile (test 1), 3 dead/immobile (test 2), 0 dead/immobile (test 3)
- Salinity Control - 0 dead / immobile

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
- Single concentration test was not conducted, dilution series tests were conducted

Reporting Requirements for Reference Method EPS 1/RM/14

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
- Test 1: 48-h LC_{50} = > 100% effluent
- Test 2: 48-h LC_{50} = > 100% effluent
- Test 3: 48-h LC_{50} = > 100% effluent

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
- Reference toxicity tests for Toxicant: Zinc
- Test 1: (July-6-04) 48-h LC_{50} = 483µg/L Zinc, 95% CL = 403-578µg/L
- Test 2: (July-27-04) 48-h LC_{50} = 683µg/L Zinc, 95% CL = 578-807µg/L
- Test 3: (Aug-24-04) 48-h LC_{50} = 536µg/L Zinc, 95% CL = 438-656µg/L

APPENDIX C

7-d Topsmelt Growth and Survival Toxicity Test

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 - Wednesday July 7, 2004 – 1100h
     Test 2 - Tuesday July 27, 2004 – 0930h
     Test 3 – Tuesday Aug 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) Tests 1 & 2
   - Patrick Allard (Azimuth) Test 3

Test Organisms Imported from External Supplier

i. Species of test organism
   - Topsmelt (*Atherinops affinis*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Aquatic Bio Systems (ABS), Fort Collins, Colorado

iv. Date test species acquired on
   - Test 1 – July 8, 2004
   - Test 2 – July 29, 2004
   - Test 3 – August 26, 2004

v. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vi. Percent mortality of fish in 24-hour period preceding the test
   - Test 1 - <10% mortality
   - Test 2 - <10% mortality
   - Test 3 - <10% mortality

vii. Age at start of test
   - Test 1 - 11 days post-hatch
   - Test 2 – 10 days post-hatch
   - Test 3 – 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
   - None noted for any test.

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
   - All tests - Larvae actively feeding and swimbladders not inflated

x. Confirmation that temperature change was <3°C and dissolved oxygen was maintained at >6mg/L during transport

- Temperature change was <2°C and dissolved oxygen supersaturated mg/L during transport

xi. Test organism acclimation rate at the testing laboratory
- Holding water conditions upon arrival were DO=supersaturated, pH = 7.9, T = 20°C
- Organisms were acclimated slowly overnight
- Addition of EVS lab seawater at intervals of 30 – 60min to reach acceptable conditions
- Organisms were acclimated to DO = 7.4mg/L, salinity = 28ppt, T=20°C

Test Facilities and Conditions

i. Test type & method
- 7-day Topsmelt (*Atherinops affinis*) Survival and Growth Toxicity Test
- Static renewal
- Sample water was renewed daily
- Reference Method - EPA/600/R-95/136 (EPAW 95-EPA West Coast)

ii. Indications of deviations from requirements in Sections 11 of Method EPA/600/R-95/136 (EPAW 95-EPA West Coast)
- No deviations from requirements
- Salinity controls were run
- Sample water salinity for
    - Test 1 was 7ppt
    - Test 2 was 2.6 ppt
    - Test 3 was 5.2ppt

iii. Date and time for start of definitive test
- Test 1 Saturday July 10, 2004 – 1730h
- Test 2 Friday July 30, 2004 – 1500h
- Test 3 Tuesday August 27, 2004 – 1230h

iv. Test vessel description
- For all tests was a 600mL beaker

v. Person(s) performing the test and verifying the results
- Test 1: Testing by: Andy Diewald, Anja Fouche, Keven Goodearle, Ann-Marie Norris and Jenny Shao; Statistical analyses by Jenny Shao and QA/QC by Julianna Kalokai
- Test 2: Testing by: Andy Diewald, Ann-Marie Norris and Jenny Shao; Statistical analysis by Jenny Shao and Kathryn Sentance; QA/QC by Armando Tang
- Test 3: Testing by Andy Diewald, Anja Fouche and Jenny Shao; Statistics by Jenny Shao and Kathryn Sentance; QA/QC by Julianna Kalokai

vi. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
- Test 1: pH 8.1, T 19.5 °C, DO 9.3 mg/L, C 11660 µmhos/cm
- Test 2: pH 7.8, T 20.0 °C, DO 10.7 mg/L, C 4880 µmhos/cm
- Test 3: pH 7.6, T 20.0 °C, DO 10.1 mg/L, C 9230 µmhos/cm

vii. Confirmation that no adjustment of sample or solution pH occurred
- No pH adjustment

viii. Indication of aeration of test solutions before introduction of fish
- Pre-aeration at 6.5mL/min/L for 30mins due to supersaturation of sample with O_2 when sample was heated to 19°C

ix. Indication that EC guidance document for salinity adjustment was followed
- The following was done for all 3 tests:
    - No deviations from EC guidance document on preparation of hypersaline brine
    - HSB prepared from natural seawater concentrated to 90ppt (by freezing/refreezing to remove frozen layer and concentrate salts)

- No deviations from EC guidance document for salinity adjustment of sample
- HSB was added to samples to salinity adjust them to 30ppt

x. Type and source of control/dilution water
- For all 3 tests, control/dilution water was UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xi. Concentrations and volumes tested:
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- For Test 1:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.5% - 200mL
    - 9.1% - 200mL
    - 18.2% - 200mL
    - 36.3% - 200mL
    - 72.6% - 200mL
- For Test 2:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.3% - 200mL
    - 8.6% - 200mL
    - 17.3% - 200mL
    - 34.5% - 200mL
    - 69.0% - 200mL
- For Test 3:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.4% - 200mL
    - 9.0% - 200mL
    - 18.0% - 200mL
    - 36.0% - 200mL
    - 71.0% - 200mL

xii. Number of replicated per concentration
- For all 3 tests: 5 replicates per concentration

xiii. Number of organisms added to each test vessel
- For all 3 tests: 5 fish per vessel

xiv. Manner and rate of exchange of test solutions
- For all 3 test: Daily renewal

xv. Measurements of dissolved oxygen, pH and temperature
- Test 1: DO: 6.1 - 7.9 mg/L, pH: 7.8 - 8.3, T: 19.0 - 21.0 °C
- Test 2: DO: 6.4 - 7.7 mg/L, pH: 7.8 - 8.1, T: 20.0 – 20.5 °C
- Test 3: DO: 6.4 - 7.6 mg/L, pH: 7.8 - 8.3, T: 20.0 - 21.0 °C

Results

i. Number and % of mortalities of fish in each test solution
- Test 1: Totals from all 5 replicates are presented:
    - Control (0%) – 1/25 = 4%

        - Salinity Control 1/25 = 4%
        - 4.5% - 0/25 = 0%
        - 9.1% - 0/25 = 0%
        - 18.2% - 0/25 = 0%
        - 36.3% - 1/25 = 4%
        - 72.6% - 2/25 = 8%
    - Test 2: Totals from all 5 replicates are presented:
        - Control (0%) – 0/25 = 0%
        - Salinity Control 0/25 = 0%
        - 4.3% - 1/25 = 4%
        - 8.6% - 1/25 = 4%
        - 17.3% - 0/25 = 0%
        - 34.5% - 0/25 = 0%
        - 69.0% - 1/25 = 4%
    - Test 3: Totals from all 5 replicates are presented:
        - Control (0%) – 0/25 = 0%
        - Salinity Control 0/25 = 0%
        - 4.4% - 0/25 = 0%
        - 9.0% - 0/25 = 0%
        - 18.0% - 0/25 = 0%
        - 36.0% - 1/25 = 4%
        - 71.0% - 0/25 = 0%

ii. Average dry weight per original fish in test vessel

- Test 1: Means from all 5 replicates are presented:
    - Control (0%) – 0.93 mg
    - Salinity Control – 1.08 mg
    - 4.5% - 1.00 mg
    - 9.1% - 1.04 mg
    - 18.2% - 0.96 mg
    - 36.3% - 1.10 mg
    - 72.6% - 0.99 mg
- Test 2: Means from all 5 replicates are presented:
    - Control (0%) – 0.98 mg
    - Salinity Control – 0.99 mg
    - 4.3% - 0.91 mg
    - 8.6% - 0.87 mg
    - 17.3% - 0.78 mg
    - 34.5% - 0.90 mg
    - 69.0% - 0.77 mg
- Test 3: Means from all 5 replicates are presented:
    - Control (0%) – 0.93 mg
    - Salinity Control – 0.96 mg
    - 4.4% - 1.06 mg
    - 9.0% - 0.87 mg
    - 18.0% - 0.97 mg
    - 36.0% - 0.92 mg
    - 71.0% - 0.87 mg

iii. Estimate of 7-d LC_{50} (95% CL)

- Test 1: 7-d LC_{50} concentration > 72.6% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d LC_{50} concentration > 69.0% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 3: : 7-d LC_{50} concentration > 71.0% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

iv. Estimate of 7-d IC_{25} (95% CL) for growth

- Test 1: 7-d IC_{25} concentration > 72.6% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d IC_{25} concentration > 69.0% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 3: 7-d IC_{25} concentration > 71.0% effluent (highest concentration tested due to dilution for salinity adjustment)

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on July 10, 2004, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 161mg/L Cu, 95% CL = 139-188mg/L
    - 7-d IC_{50} growth = 147mg/L Cu, 95% CL = 119-169mg/L
- Test 2 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on July 30, 2004, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 130mg/L Cu, 95% CL = 115-147mg/L
    - 7-d IC_{50} growth = 124mg/L Cu, 95% CL = 87-144mg/L
- Test 3 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on August 27, 2004, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 121mg/L Cu, 95% CL = 107-137mg/L
    - 7-d IC_{50} growth = 128mg/L Cu, 95% CL = 85-150mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 137 ± 56mg/L Cu
    - 7-d IC_{50} growth = 135 ± 51mg/L Cu
- Test 2: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 129 ± 48mg/L Cu,
    - 7-d IC_{50} growth = 130 ± 52mg/L Cu
- Test 3: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 132 ± 48mg/L Cu,
    - 7-d IC_{50} growth = 131 ± 51mg/L Cu

APPENDIX D

92-h Echinoderm Fertilization Test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75^{o} 22' 32" N, 97^{o} 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 - Wednesday July 7, 2004 – 1100h
     Test 2 - Tuesday July 27, 2004 – 0930h
     Test 3 – Tuesday Aug 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) Tests 1 & 2
   - Patrick Allard (Azimuth) Test 3

Test Organisms

i. Species of test organism
   - Sandollar Echinoid (*Dendraster excentricus*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - M-REP, Escondido, California
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - Test 1: Test was not initiated due to inability of the Sandollars to spawn.
   - Test 2: July 30, 2004
   - Test 3: August 27, 2004

v. Holding time and conditions for adults
   - Test 1: N.A.
   - Test 2: Adults received at the testing laboratory the day of the test.
   - Test 3: Adults received at the testing laboratory the day of the test.

vi. Indications of deviations from EC guidance on the importation of test organisms
   - Test 1: na
   - Test 2: No deviations from EC requirements
   - Test 3: No deviations from EC requirements

vii. Weekly percent mortality of adults being held over 7d preceding test
   - Test 1: na
   - Test 2: <2% per day over the 7 days preceding the test
   - Test 3: <2% per day over the 7 days preceding the test

viii. Age of test organisms
   - Test 1: n.a.
   - Test 2: < 4 hours after spawning

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Test 3: < 4 hours after spawning

ix. Unusual appearance, behaviour, or treatment of adults or gametes before test start
- Test 1: Test was not initiated due to inability of the Sandollars to spawn
- Test 2 Organisms appear healthy
- Test 3: Organisms appear healthy

Test Facilities and Conditions

i. Test type & method
- Echinoderm (*Dendraster excentricus*) Fertilization Toxicity Test
- Static
- Reference Method – EPS/1/RM/27 with 1997 amendments

ii. Test duration
- Test 1: na
- Test 2: 10:10 min (10min sperm + 10min sperm & egg)
- Test 3: 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test
- Test 1: na
- Test 2: Friday July 30, 2004 – 1620h
- Test 3: Friday August 27, 2004 – 1334h

iv. Test vessel description
- Test 1: na
- Test 2: 16 x 125mm test tubes
- Test 3: 16 x 125mm test tubes

v. Person(s) performing the test and verifying the results
- Test 1: na
- Test 2: Testing by Kathryn Sentance and Ann-Marie Norris. Statistical analyses by Jenny Shao and Kathryn Sentance. QA/QC reviewed by Julianna Kalokai.
- Test 3: Testing by Kathryn Sentance and Ann-Marie Norris. Statistical analyses by Jenny Shao and Kathryn Sentance. QA/QC reviewed by Julianna Kalokai.

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- Test 1: na
- Test 2: No pre-aeration noted.
- Test 3: No pre-aeration noted.

vii. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: na
- Test 2: No pH adjustment
- Test 3: No pH adjustment

viii. Procedure for sample filtration
- Test 1: na
- Test 2: No sample filtration
- Test 2: No sample filtration

ix. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997
- Test 1: na
- Test 2: 30 ppt adjusted with hypersaline brine (HSB). Preparation of HSB and salinity adjustment as per EC guidance document on Salinity adjustment – July 1997
- Test 2: 30 ppt adjusted with hypersaline brine (HSB). Preparation of HSB and salinity adjustment as per EC guidance document on Salinity adjustment – July 1997

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- No deviations from EC guidance for salinity adjustment
- Test 1: na
- Test 2: salinity adjusted from 2.8 to 28 ppt
- Test 3: salinity adjusted from 5 to 28 ppt

xi. Type and source of control/dilution water
- Test 1: na
- Test 2: UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium
- Test 3: UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xii. Concentrations and volumes tested
- Test 1: na
- Test 2: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.6% - 10mL
    - 9.1% - 10mL
    - 18.3% - 10mL
    - 36.6% - 10mL
    - 73.1% - 10mL
- Test 3: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.7% - 10mL
    - 9.4% - 10mL
    - 18.8% - 10mL
    - 37.5% - 10mL
    - 75.1% - 10mL

xiii. Number of replicated per concentration
- Test 1: na
- Test 2: 4 replicates per treatment concentration
- Test 3: 4 replicates per treatment concentration

xiv. Number of organisms per container
- Test 1: na
- Test 2: 100 eggs per vessel
- Test 3: 100 eggs per vessel

xv. Measurements of pH and dissolved oxygen in sample water before use
- Test 1: na
- Test 2: pH 8.1, DO 8.5
- Test 3: pH 8.0, DO 8.5

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- Test 1: na
- Test 2: pH – 8.0 – 8.1, T - 15.0-16.0°C, DO - 8.2-8.5mg/L, salinity - 28ppt
- Test 3: pH – 8.2 – 8.5, T - 15.0-16.0°C, DO - 8.2-8.5mg/L, salinity - 28ppt

Results

i. Number and % of fertilized eggs in each test concentration
- Test 1: na
- Test 2: (Number is equal to percent since totals were 100)
    - Control (0%): #F = 59, 62, 56, 65 #UF = 41, 38, 44, 35
    - Salinity Control: #F = 60, 57, 59, 62 #UF = 40, 43, 41, 38

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- 4.6%: #F = 60, 66, 56, 58 #UF = 40, 34, 44, 42
- 9.1%: #F = 46, 42, 45, 42 #UF = 54, 58, 55, 58
- 18.3%: #F = 39, 39, 37, 36 #UF = 61, 64, 63, 64
- 36.6%: #F = 31, 34, 25, 31 #UF = 69, 66, 75, 69
- 73.1%: #F = 19, 20, 21, 20 #UF = 81, 80, 79, 80

- Test 3: (Number is equal to percent since totals were 100)
  - Control (0%): #F = 77, 80, 74, 77 #UF = 23, 20, 26, 23
  - Salinity Control: #F = 76, 73, 79, 77 #UF = 24, 27, 21, 23
  - 4.7%: #F = 78, 74, 76, 72 #UF = 22, 26, 24, 28
  - 9.4%: #F = 61, 62, 62, 60 #UF = 39, 38, 38, 40
  - 18.8%: #F = 56, 58, 59, 55 #UF = 44, 42, 41, 45
  - 37.5%: #F = 49, 50, 50, 48 #UF = 51, 50, 50, 52
  - 75.1%: #F = 25, 27, 24, 27 #UF = 75, 73, 76, 73

ii. Estimate of IC_{25} (95% CL) for fertilization success

- Test 1: na
- Test 2: IC_{25} concentration = 8.7 (7.6 – 9.9)% v/v effluent
- Test 3: IC_{25} concentration = 17.5 (11.6 – 22.6)% v/v effluent

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization

- Test 1: na
- Test 2: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on July 30, 2004, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 2.1mg/L SDS, 95% CL = (1.9 – 2.4)mg/L
- Test 3: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on August 27, 2004, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 2.3mg/L SDS, 95% CL = (2.1 – 2.4)mg/L

iv Reference toxicant warning limits (+/- 2SD) for IC_{50} for fertilization

- Test 1: na
- Test 2: 4.2 +/- 4.8 mg/L SDS
- Test 3: 3.9 +/- 4.6 mg/L SDS

APPENDIX E

7-d Sublethal *Champia* (Algae) Toxicity Test

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Test 1 - Wednesday July 7, 2004 – 1100h
     Test 2 - Tuesday July 27, 2004 – 0930h
     Test 3 – Tuesday Aug 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 1 x 4L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) Tests 1 & 2
   - Patrick Allard (Azimuth) Test 3

vii. Temperature of water upon receipt at lab
   - Test 1: Test was not conducted as sample was delayed by weather and person qualified to conduct the work at the lab left for vacation. This was discussed with Sandra Blenkinsopp at the time to provide direction.
   - Test 2: 8°C
   - Test 3: 17°C

Test Organisms

i. Species of test organism
   - Algae (*Champia parvula*)

ii. Name and city of testing laboratory
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species
   - Test 1: na
   - Test 2 and Test 3
     - Sexually mature male and female branches
     - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
     - Appear in good health
     - Females have trichogynes, males have sori with spermatia

Test Facilities and Conditions

i. Test type & method
   - *Champia parvula* sexual reproduction test
   - Static, non-renewal
   - 2-day exposure, followed by 5-7 day recovery period for cystocarp development
   - Reference Method - EPA/600/4-91/003, Method 1009.0

ii. Date and time for start of definitive test
   - Test 1: na

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

- Test 2: Friday July 30, 2004 – time not noted but lab notes state tests started within 72 hrs of collection
- Test 3: Friday August 27, 2004 – time not noted but lab notes state tests started within 72 hrs of collection

iii. Test vessel description
- Test 1: na
- Test 2: 270mL transparent polystyrene cups with polystyrene lids
- Test 2: 270mL transparent polystyrene cups with polystyrene lids

iv. Person(s) performing the test and verifying the results
- Test 1: na
- Tests 2 & 3 - Mary Moody

v. Indication of pre-aeration of test solutions
- Test 1: na
- Tests 2 & 3 - No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
- Test 1: na
- Tests 2 & 3: - No pH adjustment

vii. Indication that EC guidance document for salinity adjustment was followed
- Test 1: na
- Test 2:
    - No deviations from EC guidance document on preparation of hypersaline brine
    - HSB prepared from natural seawater at 90ppt
    - No deviations from EC guidance document for salinity adjustment of sample
    - Salinity adjustment: 600mL effluent + 250mL HSB + 8.5mL test nutrient solution
    - Salinity of samples adjusted from 4ppt to 30ppt
- Test 3:
    - No deviations from EC guidance document on preparation of hypersaline brine
    - HSB prepared from natural seawater at 90ppt
    - No deviations from EC guidance document for salinity adjustment of sample
    - Salinity adjustment: 600mL effluent + 230mL HSB + 10 ml test nutrient solution
    - Salinity of samples adjusted from 5ppt to 30ppt

viii. Type and source of control/dilution water
- Test 1: na
- Tests 2 & 3
    - Natural seawater collected at the Pacific Environmental Center, Environment Canada, North Vancouver, BC
    - Filtered to 0.2μm and autoclaved prior to use
    - Salinity adjusted as per EC guidance document to 30ppt with HSB from the same source

ix. Concentrations and volumes of test solutions
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Test 1: na
- Tests 2:
    - Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
    - Salinity Control Brine (0%) - 100mL, 4.5cm depth
    - 4.38% - 100mL, 4.5cm depth
    - 8.75% - 100mL, 4.5cm depth
    - 17.5% - 100mL, 4.5cm depth

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

- 35.0% - 100mL, 4.5cm depth
- 70.0% - 100mL, 4.5cm depth

- Tests 3:
  - Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
  - Salinity Control Brine (0%) - 100mL, 4.5cm depth
  - 4.5% - 100mL, 4.5cm depth
  - 9.0% - 100mL, 4.5cm depth
  - 18.0% - 100mL, 4.5cm depth
  - 36.0% - 100mL, 4.5cm depth
  - 72.0% - 100mL, 4.5cm depth

x. Number of replicated per concentration
- Test 1: na
- Tests 2 & 3: 3 replicates per concentration

xi. Number of organisms per test chamber
- Test 1: na
- Tests 2 & 3: 5 female branches + 2 male branches per chamber

xii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use
- Test 1: na
- Test 2: pH - 7.78, T – 22.0 °C, DO – 7.9mg/L, salinity - 4ppt
- Test 3: pH - 7.58, T – 23.0 °C, DO – 8.0mg/L, salinity - 5ppt

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample during test
- Test 1: na
- Test 2: pH – 8.20, T – 23 °C, DO – 7.9, salinity: 30ppt
- Test 3: pH – 8.33, T – 22 °C, DO – 7.9, salinity: 29ppt

Results

i. Number and % mortality of female plants after recovery in each test solution
- Totals from all 3 replicates are presented:
- Test 1: na
- Test 2:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 4.38%: 0 (0%) mortality
  - 8.75%: 0 (0%) mortality
  - 17.5%: 0 (0%) mortality
  - 35.0%: 0 (0%) mortality
  - 70.0%: 0 (0%) mortality
- Test 3:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 4.5%: 0 (0%) mortality
  - 9.0%: 0 (0%) mortality
  - 18.0%: 0 (0%) mortality
  - 36.0%: 0 (0%) mortality
  - 72.0%: 0 (0%) mortality

Reporting Requirements for Reference Method EPA/600/4-91/003 Method 1009.0

ii. Mean number of cystocarps per plant in each test concentration

- Test 1: na
- Test 2:
    - Control (0%): 92.1
    - Salinity Control (0%): 92.5
    - 4.38%: 105.1
    - 8.75%: 105.1
    - 17.5%: 90.7
    - 35.0%: 61.9
    - 70.0%: 13.3
- Test 3:
    - Control (0%): 58.3
    - Salinity Control (0%): 58.6
    - 4.5%: 59.7
    - 9.0%: 59.4
    - 18.0%: 60.9
    - 36.0%: 51.3
    - 72.0%: 26.3

iii. Estimate of IC_{25} (95% CL) for cystocarp development

- Test 1: na
- Test 2: IC_{25} concentration = 26.6 (20.8 – 31.5)% effluent v/v
- Test 3: IC_{25} concentration = 45.3 (36.3 – 58.1)% effluent v/v
- Quantal statistic method was linear interpolation

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test 1: na
- Test 2: Test conducted on July 27, 2004, within 30 days of effluent test
    - Reference toxicant test was conducted under the same experimental conditions as the effluent test
    - IC_{50} cystocarp development = 1.48mg/L SDS, 95% CL = (1.38 - 1.62) mg/L
    - Reference toxicity warning limits 1.40 (+/- 2SD) for IC_{50} for cystocarp development
- Test 3: Test conducted on July 27, 2004, within 30 days of effluent test
    - Reference toxicant test was conducted under the same experimental conditions as the effluent test
    - IC_{50} cystocarp development = 1.48mg/L SDS, 95% CL = (1.38 - 1.62) mg/L
    - Reference toxicity warning limits 1.40 (+/- 2SD) for IC_{50} for cystocarp development

v. Reference toxicant warning limits (+/- 2SD) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test 1: na
- Test 2: 1.40 (1.6-1.70) mg/L SDS
- Test 3: 1.40 (1.6-1.70) mg/L SDS

APPENDIX F

Effluent Metals Concentrations and Loadings

2004 3rd QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
05-Jul-04	7-Jul-04	0.001	0.003	0.005	0.003	0.004	0.198	117	0.020	8.1	Water pump
12-Jul-04	13-Jul-04	0.002	0.001	0.005	0.000	0.002	0.106	6	0.007	7.9	Water pump
19-Jul-04	20-Jul-04	0.002	0.000	0.005	0.001	0.001	0.044	3	0.005	7.9	Water pump
26-Jul-04	27-Jul-04	0.001	0.001	0.005	0.002	0.002	0.043	3	0.005	7.9	Water pump
02-Aug-04	3-Aug-04	0.000	0.001	0.005	0.003	0.003	0.035	3	0.006	8.0	Grab
09-Aug-04	10-Aug-04	0.001	0.001	0.006	0.001	0.007	0.048	3	0.005	8.0	Grab
16-Aug-04	17-Aug-08	0.000	0.001	0.005	0.002	0.006	0.042	5	0.010	8.0	Water pump
23-Aug-04	24-Aug-04	0.000	0.001	0.005	0.001	0.010	0.050	4	0.008	7.8	Water pump
30-Aug-04	31-Aug-04	0.000	0.001	0.005	0.003	0.013	0.078	15	0.008	7.9	Grab
06-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
13-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
20-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
27-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
July/04	0.002	0.001	0.005	0.002	0.002	0.098	32	0.009
August/04	0.001	0.001	0.005	0.002	0.005	0.072	18	0.008
September/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
05-Jul-04	7-Jul-04	0.018	0.054	0.091	0.054	0.072	3.588	2120	362,440	18,122
12-Jul-04	13-Jul-04	0.752	0.376	1.880	0.000	0.752	39.850	2256	2,631,608	375,944
19-Jul-04	20-Jul-04	0.205	0.000	0.512	0.102	0.102	4.509	307	512,395	102,479
26-Jul-04	27-Jul-04	0.028	0.028	0.141	0.056	0.056	1.213	85	141,090	28,218
02-Aug-04	3-Aug-04	0.000	0.026	0.132	0.079	0.079	0.926	79	158,700	26,450
09-Aug-04	10-Aug-04	0.026	0.026	0.155	0.026	0.181	1.243	78	129,470	25,894
16-Aug-04	17-Aug-08	0	0	0	0	0	0	0	0	0
23-Aug-04	24-Aug-04	0	0	0	0	0	0	0	0	0
30-Aug-04	31-Aug-04	0	0	0	0	0	0	0	0	0
06-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0
13-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0
20-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0
27-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note [2] - "nd" refers to no effluent discharge to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
July/04	7.77	3.55	20.33	1.65	7.62	381.00	36,952.22	28,268,381	131,191	4,066,913
August/04	0.16	0.32	1.78	0.65	1.62	13.45	973.60	1,786,654	10,469	324,533
September/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

APPENDIX G

Results of Effluent Characterization

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

Nine effluent samples were collected on a weekly basis during the 3rd Quarter of 2004 beginning on July 7, 2004 and ceasing on August 31, 2004. Four of the nine samples were "monthly" samples and analysed for a wider suite of elements, as per the guidance document. Monthly loadings of metals to Garrow Bay were calculated based on average weekly discharge volumes from Garrow Lake to Garrow Bay via the creek outflow.

Monthly characterization samples were attempted during early July however ice conditions at Garrow Bay made it unsafe to collect Garrow Bay water samples until July 27, 2004. During the July 27th sampling event it was still not safe to collect reference samples due to ice conditions. On August 17th and again on August 24th monthly characterization samples were obtained including Garrow Bay and the reference location.

No holding times were missed for any of the water chemistry of toxicity testing samples.

Water samples for acute and sublethal toxicity testing were collected using a pump system from about 20 m downstream of the dam on Garrow Lake, within the main flow of the creek. Acute Lethality Testing was conducted 3 times during two months (2 in July and 1 in August) during the quarter. There were no adverse effects observed for either the 96-hr Rainbow Trout toxicity tests, or the 48-hr *Daphnia magna* toxicity tests. LC_{50} values were >100% effluent for both species in all testing events.

Sublethal Toxicity Testing was attempted three times during the quarter with the first test being partially successfully completed (7-D Topsmelt successfully completed, the echinoderm fertilization toxicity test was not initiated due to the inability of the sand dollars to spawn, and the Champia parvula Sexual Reporduction test was not conducted due to laboratory problems which were out of our control), and the other two sets of sublethal toxicity tests were completed successfully. As this is considered a marine discharge, marine species were used for sublethal testing following brine adjustment of the brackish effluent (as per test protocols). Testing for fish (7-d Topsmelt growth and survival) and invertebrates (Sand dollar) was conducted at EVS Environment Consultants, Vancouver, while algae (48-h *Champia*) testing was undertaken by the Saskatchewan Research Council, Saskatoon.

There were no effects observed in the Topsmelt Survival and Growth Test at maximum concentration tested which were below 100% v/v effluent due to the salinity adjustments.

Sublethal effects were observed for the echinoid and algal tests and concentrations less than 100% effluent v/v. In the echinoid *(Dendraster excentricus)* fertilization tests (EVS Consultants) for:

- The July 27, 2004 tests, the LOAEL was 4.6% v/v effluent, the IC_{25} was 8.7% v/v, and the IC_{50} was 37.3% v/v.
- The August 24, 2004 tests, the LOAEL was 4.7 %v/v effluent, the IC_{25} was 17.5%v/v, and the IC_{50} was 50.7%v/v.

In the *Champia parvula* sexual reproduction test (Saskatchewan Research Council) for:

- The July 27, 2004 tests, the LOAEL was 35%v/v effluent, the IC_{25} (95% CL) was 26.6% v/v and the IC_{50} (95% CL) was 43.3% v/v.
- The August 24, 2004 tests, the LOAEL was 72%v/v effluent, the IC_{25} (95% CL) was 45.3% v/v and the IC_{50} (95% CL) was 66.8% v/v.

Zinc was the primary contaminant of potential concern (COPC) identified in mine effluent and is the only metal to consistently exceed BC Ambient Water Quality Guidelines (BC AWQG) in effluent. During the 9 week discharge period, effluent zinc concentration averaged 72 µg/L (range 35 – 198µg/L), which is well below the MMER effluent limit of 500µg/L. The BC AWQG is 10µg/L. On July 27, 2004 and August 24, 2004 when the sublethal samples were collected, the respective concentrations of Zn in the effluent was 43µg/L and 50 µg/L. Converting the echinoid test endpoints for the July 27, 2004 tests into Zn concentrations results in a Lowest Observed Adverse Effect Level (LOAEL) of 1.9µg/L Zinc, an IC_{25} of 3.7µg/L, and an IC_{50} of 16.0µg/L. Converting the echinoid test endpoints for the August 24, 2004 tests into Zn concentrations results in a Lowest Observed Adverse Effect Level (LOAEL) of 2.3µg/L Zinc, an IC_{25} of 8.8µg/L, and an IC_{50} of 25.4µg/L. Reference toxicity tests of zinc on *Dendraster* fertilization give mean EC_{50} concentrations of 8.5-60µg/L (Dinnel et al. 1983). The concentrations of zinc in the effluent that corresponds to the IC_{50} (i.e., 16.0 to 25.4 µg/L) are within the effects range reported in reference *Dendraster* fertilization tests. Thus the echinoid test is quite sensitive to zinc, with the LOAELs being less than the BC AWQG concentration.

Endpoints for the July 27, 2004 *Champia* test in terms of zinc concentrations were 15.1µg/L Zn (LOAEL), 11.4µg/L (IC_{25}), and 18.6µg/L (IC_{50}). Endpoints for the August 24, 2004 *Champia* test in terms of zinc concentrations were 36µg/L Zn (LOAEL), 22.6µg/L (IC_{25}), and 33.4µg/L (IC_{50}). The reference IC_{25} endpoint for zinc in the *Champia* test performed in-house at SRC was 27µg/L (95% confidence limits 16-42µg/L). This reference concentration is very similar to zinc concentrations in the mine effluent at the toxicity endpoints observed in the *Champia* test.

Given the similarity between zinc concentrations in the effluent samples and the effects concentrations of zinc in reference tests, it is likely that zinc is responsible for the sublethal effects observed in both the *Dendraster* and *Champia* tests.

Reference: Dinnel, P.A., Q.J. Stober, J.M. Link, M.W. Letourneau, W.E. Roberts, S.P. Felton, and R.E. Nakatan. 1983. Methodology and Validation of a Sperm Cell Toxicity Test for Testing Toxic Substances in Marine Waters. Final Report, FRI-UW-8306, Fisheries Research Inst., School of Fisheries, University of Washington, Seattle, WA :208. Source: EPA EcoTox database.

Bruce J. Donald
Reclamation Manager

March 15, 2005

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – 2004 4th Quarter Metal Mining Effluent Regulations Report

Despite having a designated discharge location for effluent identified under Section 9 of the MMER, there was no discharge from the Garrow Lake Tailings Impoundment Area during the period October 1, 2004 to December 31, 2004. While there is no data to report, I have completed the monitoring report as required by the regulations and have attached it to this letter.

If you have any questions regarding the quarterly report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me at any time.

Yours truly,

Bruce Donald

Attachments: 4th Quarter 2004 Monitoring Report

cc:
Walter Kuit (Teck Cominco Limited)
Randy Baker (Azimuth Consulting Group)

POLARIS MINE – MMER MONITORING REPORT

4th QUARTER 2004

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14

APPENDIX C

i. Concentration & monthly mean concentrations of each deleterious substance of Schedule 4
ii. pH of the effluents samples as required by subsection 12(1)
iii. Description of sample collection method
iv. Total volume of effluent deposited during each month of the quarter as per section 19
v. Mass loading of the deleterious substances set out in Schedule 4 and as per section 20

APPENDIX D

i. Results of the effluent characterization as per paragraph 15(1)(a)

APPENDIX A

Reporting Requirements for Reference Method EPS 1/RM/13

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Percent mortality of fish in stock tank(s)
   - None to report. There were no tests conducted during the period

v. Species of test organism
   - None to report as there were no tests conducted during the period

vi. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vii. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

ix. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

x. Indication of aeration of test solutions before introduction of fish
   - None to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Number of fish added to each test vessel
   - No fish added as there were no tests conducted during the period

xiv. Mean and range of fork length of control fish at end of test
   - No data to report as there were no tests conducted during the period

xv. Mean wet weight of individual control fish at end of the test
   - No data to report as there were no tests conducted during the period

xvi. Estimated loading density of fish in test solutions
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/13 - Continued

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
   - None to report. No tests conducted during the period

ii. Number of control fish showing atypical/stressed behaviour
   - None to report. No tests conducted.

iii. Mean mortality rate in solutions of effluent and control water
   - None to report. No tests conducted

iv. Estimate of 96-h LC50 in multi-concentration tests
   - No data to report. No tests conducted

v. Most recent 96-h LC50 for reference toxicity test(s)
   - No data to report. No tests conducted

APPENDIX B

Reporting Requirements for Reference Method EPS 1/RM/14

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 96° 48' 37" W.

ii. Date & time of sampling
   - No sampling conducted as there was no effluent discharge during the quarter.

iii. Type of sample
   - No sampling conducted as there was no effluent discharge during the quarter

iv. Brief description of sampling point
   - Discharge point of siphon at Garrow Lake dam

v. Sampling method
   - No sampling conducted as there was no effluent discharge during the quarter

vi. Name of person submitting samples
   - No sampling conducted as there was no effluent discharge during the quarter

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - No testing conducted as there was no effluent discharge during the quarter

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations to report as there was no testing conducted during the quarter

iii. Name and city of testing laboratory
   - No laboratory used during the quarter

iv. Species of test organism
   - None to report as there were no tests conducted during the period

v. Date and time for start of definitive test
   - None to report as there were no tests conducted during the period

vi. Person(s) performing the test and verifying the results
   - No tests performed during the quarter

vii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - No data to report as there were no tests conducted during the period

viii. Confirmation that no adjustment of sample or solution pH occurred
   - No adjustment to report as there were no tests conducted during the period

ix. Indication of any adjustment of hardness of effluent sample
   - No adjustment to report as there were no tests conducted during the period

x. Indication of any aeration of sample
   - No indication to report as there were no tests conducted during the period

xi. Concentrations and volumes tested
   - No data to report as there were no tests conducted during the period

xii. Measurements of dissolved oxygen, pH and temperature
   - No data to report as there were no tests conducted during the period

xiii. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
   - No data to report as there were no tests conducted during the period

xiv. Number of neonates per test vessel and milliliters of solution per daphnid
   - No data to report as there were no tests conducted during the period

Reporting Requirements for Reference Method EPS 1/RM/14 - Continued

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
   - No data to report. No tests conducted during the period.

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
   - No data to report. No tests conducted during the period.

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
   - No data to report. No tests conducted during the period

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
   - No data to report. No tests conducted during the period.

APPENDIX C

2004 4th QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
04-Oct-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
11-Oct-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
18-Oct-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
25-Oct-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
01-Nov-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
08-Nov-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
15-Nov-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
22-Nov-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
29-Nov-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
06-Dec-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
13-Dec-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
20-Dec-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
27-Dec-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
October/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
November/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
December/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
04-Oct-04	nd[2]	0	0	0	0	0	0	0	0	0
11-Oct-04	nd[2]	0	0	0	0	0	0	0	0	0
18-Oct-04	nd[2]	0	0	0	0	0	0	0	0	0
25-Oct-04	nd[2]	0	0	0	0	0	0	0	0	0
01-Nov-04	nd[2]	0	0	0	0	0	0	0	0	0
08-Nov-04	nd[2]	0	0	0	0	0	0	0	0	0
15-Nov-04	nd[2]	0	0	0	0	0	0	0	0	0
22-Nov-04	nd[2]	0	0	0	0	0	0	0	0	0
29-Nov-04	nd[2]	0	0	0	0	0	0	0	0	0
06-Dec-04	nd[2]	0	0	0	0	0	0	0	0	0
13-Dec-04	nd[2]	0	0	0	0	0	0	0	0	0
20-Dec-04	nd[2]	0	0	0	0	0	0	0	0	0
27-Dec-04	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note [2] - "nd" refers to no effluent discharge to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
October/04	0	0	0	0	0	0	0	0	0	0
November/04	0	0	0	0	0	0	0	0	0	0
December/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

APPENDIX D

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

No effluent samples were collected during the 4th Quarter of 2004 as there was no effluent discharge.
No Acute Lethality Testing conducted during the quarter as there was no effluent being discharged.

Bruce J. Donald
Reclamation Manager

September 28, 2005

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Jenny Ferone, Regional EEM Coordinator
Peter Blackall, Regional Director of Environmental Protection

Dear Jenny Ferone and Peter Blackall;

Re: REVISED Polaris Mine 2004 Annual MMER and EEM Report

This revised report is being submitted in response to the August 9, 2005 letter from Jenny Ferone (Environment Canada) to Bruce Donald (Teck Cominco Metals Ltd.), regarding purported reporting deficiencies for the Polaris Mine 2004 Annual Report (provided in Appendix F). Azimuth staff prepared the initial 2004 Annual Report and have addressed the issues identified in the August 9th letter within this Revised 2004 Annual Report. In addition, Azimuth responded to each specific reporting issue in a letter sent to Environment Canada on behalf of Teck Cominco, dated September 14, 2005 (provided in Appendix G). Within this letter, Azimuth identified sections of the original report where some of the deficient data were presented and requested further guidance and clarification from Environment Canada on some of the reviewers' comments. Azimuth has not heard back to date, and has prepared this Revised 2004 Annual Report according to the assumptions and interpretations stated in the September 14th letter. Teck Cominco and Azimuth will ensure that all required information will be included in future reports.

Please find attached the REVISED 2004 Polaris Mine Annual Report. There was one non-compliant concentration related to Schedule 4 limits (TSS) as previously reported. There were no non-compliant results of the acute lethality tests during the year.

The following is included in our Revised 2004 Annual Report:

1. Requirements under Schedule 6
   - Identification of Site, Owner, Location, etc.
   - Non-Compliance information
   - Table 1 – Monthly Mean Concentrations, pH Range and Volume of Effluent
   - Table 2 – Results of Acute Lethality Tests and Daphnia Magna Monitoring Tests

2. Requirements under Part 1 Section 8
   - Results of studies conducted under Part 1, Section 4 (Effluent Characterization) (Table 3, Table 5)
   - Results of studies conducted under Part 1, Section 5 (Sublethal Toxicity Testing) (Table 6, Table 7, Appendix A, B, C and E) (Note that within Appendices A, B, and C, ** denotes the sections where reporting issues from the August 9th letter have been addressed)
   - Results of studies conducted under Part 1, Section 7 (Water Quality Monitoring) (Table 4, Table 5)

3. Additional Appendices
   - Appendix D – acute toxicity testing reports
   - Appendix F – Letter from Environment Canada to Teck Cominco Metals Ltd., dated August 9, 2005
   - Appendix G – Letter from Azimuth Consulting Group to Environment Canada, dated September 14, 2005.
   - Appendix H – Polaris Mine – Revised 2004 3rd Quarter Metal Mining Effluent Regulations Report (dated March 22, 2005)

As in the initial 2004 Annual Report, the revised 3rd Quarter regulatory data set is included in this submission in Appendix H. This data was revised to ensure consistency between the hardcopy and online RISS system reports.

The MMER and EEM data required to be reported in electronic format were submitted electronically through the RISS online system in March 2005, and no additional information was requested for this report format. In addition to this hardcopy report, an electronic pdf version of this report is being emailed to you (e-mailed September 28, 2005).

If you have any questions regarding the annual report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me.

Yours truly,

Original signed by B. Donald

Bruce Donald

Attachments: 2004 MMER Annual Report; Revised 2004 3rd Quarter Regulatory Data Tables

cc: Randy Baker (Azimuth Consulting Group)

Ken Russell (Environment Canada)

INFORMATION TO BE INCLUDED IN ANNUAL REPORT SUMMARY

The following information is to be submitted for each final discharge point.

Mine Name :	Polaris Mine
Mine Operator :	Cominco Mining Partnership and Teck Cominco Metals Lt
Address :	Bag 2000
	Kimberley, BC
	V1A 3E1
Telephone :	(250) 427-8405 Bruce Donald
E-mail :	bruce.donald@teckcominco.com
Location of Final Discharge point :	Garrow Lake Former Dam at 75o22'32"N, 96o48'37"W.
Reporting Period :	January 1, 2004 to December 31, 2004.
Date of Report :	March 21, 2005.

Non-Compliance Information

There was one non-compliant effluent discharge during 2004 (I.e., TSS of 117 mg/L, July 7, 2004), with respect to Schedule 4 limits. Upon receiving the results from the lab, this exceedance was reported to Environment Canada regulatory authorites in a letter dated August 12, 2004. The exceedance was due to the initial ice melt unplugging Garrow Lake, resulting in a flushing of sediment. There were no other non-compliant concentrations of substances during this initial flow, and TSS dropped to values of approximately 3-15 mg/L in all subsequent sampling events. Upon review of the information, Environment Canada recommended no further action in a letter date January 11, 2005 from Sidney Bruinsma. There were no non-compliant acute lethality tests during 2004, including tests performed on the July 7, 2004 sample.

TABLE 1

MONTHLY MEAN CONCENTRATIONS, pH RANGE AND VOLUME OF EFFLUENT (1)(2)

Month	As (mg/L)	Cu (mg/L)	CN (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	TSS (mg/L)	Ra (Bq/L)	pH range	Effluent Volume (m3)
Jan.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Feb.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Mar.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Apr.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
May	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
June	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
July	0.0015	0.0011	0.0050	0.0014	0.0024	0.0980	32.0000	0.0090	7.90 - 8.05	4066913.00
Aug.	0.0004	0.0012	0.0051	0.0019	0.0081	0.0508	6.1000	0.0074	7.84 - 8.04	324551.00
Sept.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Oct.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Nov.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Dec.	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)

(1) Any measurement not taken because there was no deposit from the final discharge point shall be identified by the letters "ND" - (No Deposit)

(2) Any measurement not taken because no measurement was required in accordance with the conditions set out in section 13 of the Regulations shall be identified by the letters "NMR" - (No Measurement Required).

TABLE 2

RESULTS OF ACUTE LETHALITY TESTS AND
DAPHNIA MAGNA MONITORING TESTS

Date Sample Collected	Effluent Acutely Lethal to Rainbow Trout (yes or no)	Effluent Acutely Lethal to *Daphnia magna* (yes or no)
7/7/2004	No	No
7/27/2004	No	No
8/24/2004	No	No

REVISED Table 3. Effluent Characterization Results (Part 1, Section 4)

Effluent Characterization from Final Discharge Point - Garrow Lake Former Dam / Syphons
Northing: 75°22'32"
Easting: 96°48'37"

Facility Name:		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)					
FDP Name:		Garrow Lake Syphons					
Sampling Date:		7/7/2004	7/27/2004	8/17/2004	8/24/2004		
Sample Method:		Grab	Grab	Grab	Grab		
Parameter	**Units**					***Detection Limit***	**Methods[1]**
Hardness	mg/L	1400	483	973	1380	*2.7*	EPA Method 3005A, ICPOES (EPA Method 6010B)[4]
Alkalinity	mg/L	138	62.4	111	128	*1.0*	APHA Method 2320 (potentiometric titration)
Aluminum	mg/L	0.34	0.021	<0.1	<0.1	*0.1*	SPR-IDA[2], Graphite Furnace Atomic Absorption Spectrophotometry
Cadmium	mg/L	0.000588	0.00014	0.00023	0.000335	*0.0002*	SPR-IDA[2], ICPMS[3]
Iron	mg/L	0.487	0.084	0.042	0.014	*0.01*	SPR-IDA[2], Flame Atomic Absorption Spectrophotometry
Mercury	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	*0.00001*	Cold Vapour Atomic Florescence Spectrophotometry
Molybdenum	mg/L	<0.005	0.0013	<0.005	<0.005	*0.005*	ICPMS[3]
Ammonia	mg/L	0.071	<0.02	0.146	0.133	*0.02*	APHA Method 4500-NH3 (selective ion electrode)
Nitrate	mg/L	0.277	0.0644	0.525	0.531	*0.01, 0.02*	APHA Method 4110 (determination of inorganic ions by ion chromatography)
Arsenic	mg/L	<0.001	<0.001	<0.0002	<0.0002	*0.001, 0.0002*	Hydride-Vapour Atomic Absorption Spectrophotometry
Copper	mg/L	0.00265	0.000518	0.00121	0.00134	*0.00005*	SPR-IDA[2], ICPMS[3]
Cyanide	mg/L	<0.005	<0.005	<0.005	<0.005	*0.005*	APHA Method 4500-CN (cynate hydrolosis using an ammonia selective electrode)
Lead	mg/L	0.00269	0.00157	0.00177	0.00119	*0.00005*	SPR-IDA[2], ICPMS[3]
Nickel	mg/L	0.00442	0.00207	0.00644	0.00967	*0.00005*	SPR-IDA[2], ICPMS[3]
Zinc	mg/L	0.198	0.0429	0.0418	0.0498	*0.0005*	SPR-IDA[2], ICPMS[3]
TSS	mg/L	117	<3	5.3	4.4	*3.0*	APHA Method 2540 (filtration through glass fibre filter)
Radium 226	Bq/L	0.02	<0.005	0.01	0.008	*0.005*	Radio Chemistry[5]
pH	pH units	8.05	7.87	7.95	7.84	*0.01*	APHA Method 4500-H (pH electrode)

Notes:

[1]Original data reports are available upon request

[2]SPR-IDA = Suspended Particulate Resin consisting of immobilized iminodiacetate on a divinyl benzene polymer is used to chelate and preconcentrate metals in seawater (preparation technique).

[3]Instrumental analysis is by ICPMS = Inductively Coupled Mass Spectrometry.

[4]This analysis is carried out using procedures adapted from "StandardMethods for the Examination of Water and Wastewater" 20th Edition 1998, published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the USEPA. The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emissionspectrophotometry ICPOES (EPA Method 6010B).

[5]All radium isotopes in the sample solution are separated by coprecipitation with lead sulfate. The precipitate is redissolved and the radium isotopes are separated by coprecipitation with barium sulfate. The precipitate is filtered and mounted on a stainless steel disk. It is then counted on an alpha spectrometer. The radium 226 alpha energy is distinct and the peak can be clearly identified.

REVISED Table 4. Water Quality Monitoring Results (Part 1, Section 7)

Station:		Exposure Area			Reference Area			
Description:		Garrow Bay at Mouth of Garrow Creek Confluence			Garrow Bay ~1km NE of exposure station (confluence with Garrow Creek).			
Northing:		75°22'15"			75°22'40"			
Easting:		96°48'30"			96°47'12"			
Facility Name:		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)			Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)			
FDP Name:		Garrow Lake Syphons			Garrow Lake Syphons			
Area Name:		Garrow Bay Exposure			Garrow Bay Reference			
Sampling Date:		7/27/2004	8/17/2004	8/24/2004	8/17/2004	8/24/2004		
Sample Method:		Grab	Grab	Grab	Grab	Grab		
Parameters	**Units**						***Detection Limit***	**Methods[1]**
Hardness	mg/L	482	2270	1750	2960	1560	*2.7*	EPA Method 3005A, ICPOES (EPA Method 6010B)[4]
Alkalinity	mg/L	37.5	45	38.8	46	36.1	*1.0*	APHA Method 2320 (potentiometric titration)
Aluminum	mg/L	0.033	<0.1	<0.1	<0.1	<0.1	*0.1*	SPR-IDA[2], Graphite Furnace Atomic Absorption Spectrophotometry
Cadmium	mg/L	0.00007	<0.00002	0.000028	<0.00002	<0.00002	*0.0002*	SPR-IDA[2], ICPMS[3]
Iron	mg/L	0.046	<0.01	<0.01	<0.01	<0.01	*0.01*	SPR-IDA[2], Flame Atomic Absorption Spectrophotometry
Mercury	mg/L	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	*0.00001*	Cold Vapour Atomic Florescence Spectrophotometry
Molybdenum	mg/L	0.00156	<0.005	<0.005	0.0062	<0.005	*0.005*	ICPMS[3]
Ammonia	mg/L	<0.02	<0.02	0.02	<0.02	<0.02	*0.02*	APHA Method 4500-NH3 (selective ion electrode)
Nitrate	mg/L	0.0372	<0.02	<0.02	<0.02	<0.02	*0.02*	APHA Method 4110 (determination of inorganic ions by ion chromatography)
Arsenic	mg/L	<0.001	<0.0002	0.00027	0.00044	<0.0002	*0.001, 0.0002*	Hydride-Vapour Atomic Absorption Spectrophotometry
Copper	mg/L	0.000405	0.000216	0.000209	0.000231	0.000205	*0.00005*	SPR-IDA[2], ICPMS[3]
Cyanide	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	*0.005*	APHA Method 4500-CN (cynate hydrolosis using an ammonia selective electrode)
Lead	mg/L	0.00026	<0.00005	0.000267	0.000052	<0.00005	*0.00005*	SPR-IDA[2], ICPMS[3]
Nickel	mg/L	0.000979	0.000252	0.000267	0.000217	0.000186	*0.00005*	SPR-IDA[2], ICPMS[3]
Zinc	mg/L	0.0242	0.00118	0.00092	0.0005	<0.0005	*0.0005*	SPR-IDA[2], ICPMS[3]
TSS	mg/L	3.7	3.3	8.4	9.3	7	*3.0*	APHA Method 2540 (filtration through glass fibre filter)
Radium226	Bq/L	<0.005	<0.005	0.006	<0.005	<0.005	*0.005*	Radio Chemistry[5]
pH	pH units	7.91	7.79	7.64	7.92	7.62	*0.01*	APHA Method 4500-H (pH electrode)
Water Temperature	°C	0.2	0.2	0.9	0.1	1.2	-	Field - Campbell Scientific Hydrolab Model H20, or YSI Meter Model 85
Dissolved Oxygen	mg/L	13.23	13.78	15.2	14.04	15.13	-	Field - Campbell Scientific Hydrolab Model H20, or YSI Meter Model 85

Notes

The Garrow Bay exposure area (mouth of the creek) was frozen during the July 7, 2004 sampling event.

Note that the reference area was ice free only during August 17 and August 24, 2004 sampling events.

[1]Original data reports are available upon request

[2]SPR-IDA = Suspended Particulate Resin consisting of immobilized iminodiacetate on a divinyl benzene polymer is used to chelate and preconcentrate metals in seawater (preparation technique).

[3]Instrumental analysis is by ICPMS = Inductively Coupled Mass Spectrometry.

[4]This analysis is carried out using procedures adapted from "StandardMethods for the Examination of Water and Wastewater" 20th Edition 1998, published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the USEPA. The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emissionspectrophotometry ICPOES (EPA Method 6010B).

[5]All radium isotopes in the sample solution are separated by coprecipitation with lead sulfate. The precipitate is redissolved and the radium isotopes are separated by coprecipitation with barium sulfate. The precipitate is filtered and mounted on a stainless steel disk. It is then counted on an alpha spectrometer. The radium 226 alpha energy is distinct and the peak can be clearly identified.

Table 5. QAQC Sample Results[1] Including Field Duplicates, Field Blanks, and Transport Blanks.

Sample Type:		Field Duplicate	Original Sample		Field Duplicate	Original Sample		Field Duplicate	Original Sample	
Location:		Garrow Lake Syphons			Garrow Bay Exposure			Garrow Lake Syphons		
Description:		Final Discharge Point		RPD[2]	Mouth of Garrow Creek Confluence		RPD[2]	Final Discharge Point		RPD[2]
Sampling Date:		7/7/2004		(%)	7/27/2004		(%)	8/17/2004		(%)
Parameters	Parameter Units									
Hardness	mg/L	1400	1400	0.00	532	482	10.37	997	973	2.47
Alkalinity	mg/L	132	138	4.35	38.6	37.5	2.93	113	111	1.80
Aluminum	mg/L	0.26	0.34	23.53	0.031	0.033	6.06	<0.10	<0.1	n/a
Cadmium	mg/L	0.000582	0.000588	1.02	0.000062	0.00007	11.43	0.000224	0.00023	2.61
Iron	mg/L	0.441	0.487	9.45	0.035	0.046	23.91	0.039	0.042	7.14
Mercury	mg/L	<0.000010	<0.00001	n/a	<0.000050	<0.00005	n/a	<0.000010	<0.00001	n/a
Molybdenum	mg/L	<0.0050	<0.005	n/a	0.00129	0.00156	17.31	<0.0050	<0.005	n/a
Ammonia	mg/L	0.069	0.071	2.82	<0.020	<0.02	n/a	0.163	0.146	11.64
Nitrate	mg/L	0.284	0.277	2.53	0.0371	0.0372	0.27	0.54	0.525	2.86
Arsenic	mg/L	<0.0010	<0.001	n/a	<0.0010	<0.001	n/a	<0.00020	<0.0002	n/a
Copper	mg/L	0.00252	0.00265	4.91	0.000342	0.000405	15.56	0.00121	0.00121	0.00
Cyanide	mg/L	<0.0050	<0.005	n/a	<0.0050	<0.005	n/a	<0.0050	<0.005	n/a
Lead	mg/L	0.0024	0.00269	10.78	0.000205	0.00026	21.15	0.00187	0.00177	5.65
Nickel	mg/L	0.00438	0.00442	0.90	0.000772	0.000979	21.14	0.00676	0.00644	4.97
Zinc	mg/L	0.196	0.198	1.01	0.019	0.0242	21.49	0.0418	0.0418	0.00
TSS	mg/L	120	117	2.56	7	3.7	89.19	<3.0	5.3	n/a
Radium226	Bq/L	0.02	0.02	0.00	<0.0050	<0.005	n/a	<0.0050	0.01	n/a
pH	pH units	8.06	8.05	0.12	7.76	7.91	1.90	8.02	7.95	0.88

Notes

[1]QAQC samples were collected during each EEM monitoring event. At least one field duplicate and/or one blank sample was collected during each event.

[2]RPD = Relative Percent Difference = [Absolute value (DUP-ORIG)/ORIG]*100%

Cells in grey shading have RPD values >50% for co-located field duplicates

[3]Distilled water from onsite distiller.

QAQC Results

A total of 4 duplicate samples and 3 blank samples were collected during the 2004 EEM program at Polaris mine. All RPD values were less than 50%, with the exception of one measurement of TSS on July 27, 2004. This data indicate good reproducibility between co-located field duplicates (i.e., low measurement and analytical variability).

Blank samples were typically less than, or slightly higher than detection limits, revealing no background contamination issues.

Table 5. QAQC Sample Results[1] Including Field Duplicates, Field Blanks, and Transport Blanks.

Sample Type:		Field Duplicate	Original Sample		Field Blank	Transport Blank	Field Blank
Location:		Garrow Lake Syphons			n/a	n/a	n/a
Description:		Final Discharge Point		RPD[2]	Distilled Water[3]	Distilled Water[3]	Distilled Water[3]
Sampling Date:		8/24/2004		(%)	7/7/2004	7/7/2004	8/17/2004
Parameters	Parameter Units						
Hardness	mg/L	1380	1380	0.00	<0.54	<0.54	<0.54
Alkalinity	mg/L	128	128	0.00	-	-	<1.0
Aluminum	mg/L	<0.10	<0.1	n/a	<0.10	<0.10	<0.0010
Cadmium	mg/L	0.000342	0.000335	2.09	<0.000020	<0.000020	<0.00020
Iron	mg/L	0.015	0.014	7.14	<0.010	<0.010	<0.030
Mercury	mg/L	<0.000010	<0.00001	n/a	<0.000010	<0.000010	<0.000010
Molybdenum	mg/L	<0.0050	<0.005	n/a	<0.0050	<0.0050	<0.0010
Ammonia	mg/L	0.114	0.133	14.29	-	-	0.028
Nitrate	mg/L	0.529	0.531	0.38	-	-	<0.0050
Arsenic	mg/L	<0.00020	<0.0002	n/a	<0.0010	<0.0010	<0.00020
Copper	mg/L	0.00140	0.00134	4.48	0.00012	0.00012	<0.0010
Cyanide	mg/L	<0.0050	<0.005	n/a	-	-	<0.0050
Lead	mg/L	0.00116	0.00119	2.52	0.00017	0.00021	<0.0010
Nickel	mg/L	0.00971	0.00967	0.41	<0.00050	<0.00050	<0.0010
Zinc	mg/L	0.0514	0.0498	3.21	0.0012	<0.0010	<0.0050
TSS	mg/L	3.7	4.4	15.91	-	-	<3.0
Radium226	Bq/L	<0.0050	0.008	n/a	<0.0050	0.006	<0.0050
pH	pH units	7.93	7.84	1.15	-	-	5.51

Notes

[1]QAQC samples were collected during each EEM monitoring event. At least one field duplicate and/or one blank sample was collected during each event.

[2]RPD = Relative Percent Difference = [Absolute value (DUP-ORIG)/ORIG]*100%

Cells in grey shading have RPD values >50% for co-located field duplicates

[3]Distilled water from onsite distiller.

QAQC Results

A total of 4 duplicate samples and 3 blank samples were collected during the 2004 EEM program at Polaris mine. All RPD values were less than 50%, with the exception of one measurement of TSS on July 27, 2004. This data indicate good reproducibility between co-located field duplicates (i.e., low measurement and analytical variability).

Blank samples were typically less than, or slightly higher than detection limits, revealing no background contamination issues.

Table 6. Sublethal Toxicity Testing Results EC50 (Part 1, Section 5)

Facility Name	FDP Name	EC25 Test Date	Species Test	Sublethal Test Type	Sample Method	Consultant Laboratory
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	7/7/2004	Atherinops affinis	Growth	Grab	EVS Consultants, North Vancouver, BC
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	7/27/2004	Atherinops affinis	Growth	Grab	EVS Consultants, North Vancouver, BC
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	7/27/2004	Dendraster excentricus	Reproduction	Grab	EVS Consultants North Vancouver, BC
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	7/27/2004	Champia parvula	Reproduction	Grab	Saskatchewan Research Council (SRC)
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	8/24/2004	Champia parvula	Reproduction	Grab	Saskatchewan Research Council (SRC)
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	8/24/2004	Dendraster excentricus	Reproduction	Grab	EVS Consultants North Vancouver, BC
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	8/24/2004	Atherinops affinis	Growth	Grab	EVS Consultants North Vancouver, BC

Table 6. Sublethal Toxicity Testing Results EC50 (Part 1, Section 5)

EC25 Test Date	Species Test	EC25 or IC25	EC25 or IC25 Lower Confidence Limit	EC25 or IC25 Upper Confidence Limit	Notes
7/7/2004	Atherinops affinis	> 72.6	72.6	72.6	IC25 (95%CL) was > 72.6%, the highest exposure concentration due to salinity adjustment.
7/27/2004	Atherinops affinis	> 69	69	69	IC25 (95% CL) was > 69%, the highest concentration tested due to salinity adjustment.
7/27/2004	Dendraster excentricus	8.7	7.6	9.9	July 7 sandollar test not initiated because sandollars did not spawn.
7/27/2004	Champia parvula	26.6	20.8	31.5	
8/24/2004	Champia parvula	45.3	36.3	58.1	
8/24/2004	Dendraster excentricus	17.5	11.6	22.6	
8/24/2004	Atherinops affinis	> 71	71	71	IC25 (95% CL) was > 71%, the highest concentration tested due to salinity adjustment.

Table 7. Sublethal Toxicity Testing Results LC50 (Part 1, Section 5)

Facility Name	FDP Name	LC50 Test Date	Species Tested	Sublethal Test Type	Sample Method	Consultant Laboratory
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	7/7/2004	Atherinops affinis	Survival	Grab	EVS Consultants, North Vancouver, BC
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	7/27/2004	Atherinops affinis	Survival	Grab	EVS Consultants, North Vancouver, BC
Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)	Garrow Lake Syphons	8/24/2004	Atherinops affinis	Survival	Grab	EVS Consultants, North Vancouver, BC

Table 7. Sublethal Toxicity Testing Results LC50 (Part 1, Section 5)

LC50 Test Date	Species Tested	LC50	LC50 Lower Limit	LC50 Upper limit	Notes
7/7/2004	Atherinops affinis	> 72.6	72.6	72.6	LC50 (95% CL) was > 72.6%, the highest exposure concentration tested, due to salinity adjustment.
7/27/2004	Atherinops affinis	> 69	69	69	LC50 (95% CL) was > 69%, the highest concentration tested due to salinity adjustment.
8/24/2004	Atherinops affinis	> 71	71	71	LC50 (95% CL) was > 71%, the highest concentration tested due to salinity adjustment.

POLARIS MINE – MMER ANNUAL SUMMARY REPORT 2004

APPENDIX A

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPAW 95-EPA West Coast: 7-day Topsmelt Survival and Growth Tests.

APPENDIX B

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPS 1/Rm/27-EC: 92 hr Echinoderm (sand dollar) Fertilization Test

APPENDIX C

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPA/600/4-91-003, Method 1009.0: Algae (*Champia parvula*) 7-day Sublethal Growth Tests

APPENDIX D

i. Acute toxicity testing laboratory reports

APPENDIX E

i. Sublethal toxicity testing laboratory reports

APPENDIX F

i. Letter from Environment Canada to Teck Cominco Metals, Ltd. re: Polaris 2004 Annual Report (dated August 9, 2005)

APPENDIX G

i. Letter from Azimuth Consulting Group, Inc. to Environment Canada re: Clarification of reporting issues outlined in August 9, 2005 letter (dated September 14, 2005)

APPENDIX H

i. Polaris Mine – Revised 2004 3rd Quarter Metal Mining Effluent Regulations Report (dated March 22, 2005)

APPENDIX A

7-d Topsmelt Growth and Survival Toxicity Test

Reporting Requirements for Reference Method EPAW 95-EPA West Coast (Topsmelt)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 - Wednesday July 7, 2004 – 1100h
     Test 2 - Tuesday July 27, 2004 – 2130h
     Test 3 – Tuesday Aug 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water from final discharge point

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 3 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) Tests 1 & 2
   - Patrick Allard (Azimuth) Test 3

vii. **Labeling/coding of sample (Sample IDs)
   - Test 1 - G-Creek_sub_070704
   - Test 2 - G-Creek_Sublethal_270704
   - Test 3 – G-Creek_081704

viii. **Date & time of sample receipt
   - Samples for sublethal toxicity testing were collected:
     Test 1 - Saturday July 10, 2004 – 1425h
     Test 2 - Friday July 30, 2004 – 1200h
     Test 3 – Friday Aug 27, 2004 – 0945h

ix. **Temperature upon sample receipt at laboratory
   - Test 1 – 11.6 °C
   - Test 2 – 13.0 °C
   - Test 3 – 15.4 °C

Test Organisms Imported from External Supplier

i. Species of test organism
   - Topsmelt (*Atherinops affinis*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Aquatic Bio Systems (ABS), Fort Collins, Colorado

iv. Date test species acquired on
   - Test 1 – July 8, 2004
   - Test 2 – July 29, 2004
   - Test 3 – August 26, 2004

v. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

Reporting Requirements for Reference Method EPAW 95-EPA West Coast (Topsmelt)

vi. Percent mortality of fish in 24-hour period preceding the test
- Test 1 - <10% mortality
- Test 2 - <10% mortality
- Test 3 - <10% mortality

vii. Age at start of test
- Test 1 - 11 days post-hatch
- Test 2 – 10 days post-hatch
- Test 3 – 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
- None noted for any test.

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
- All tests - Larvae actively feeding and swimbladders not inflated

x. Confirmation that temperature change was <3°C and dissolved oxygen was maintained at >6mg/L during transport
- Temperature change was <2°C and dissolved oxygen supersaturated mg/L during transport

xi. Test organism acclimation rate at the testing laboratory
- Holding water conditions upon arrival were DO=supersaturated, pH = 7.9, T = 20°C
- Organisms were acclimated slowly overnight
- Addition of EVS lab seawater at intervals of 30 – 60min to reach acceptable conditions
- Organisms were acclimated to DO = 7.4mg/L, salinity = 28ppt, T=20°C

Test Facilities and Conditions

i. Test type & method
- 7-day Topsmelt (*Atherinops affinis*) Survival and Growth Toxicity Test
- Static renewal
- Sample water was renewed daily
- Reference Method - EPA/600/R-95/136 (EPAW 95-EPA West Coast)

ii. **Dates or test days during test when subsamples or multiple samples were renewed
- Samples were renewed daily for all tests (Test Day 1,2,3,4,5,6)
- Three subsamples were used on days i) 0-1; ii) 2-3; and iii) 4-5-6-7

iii. Indications of deviations from requirements in Sections 11 of Method EPA/600/R-95/136 (EPAW 95-EPA West Coast)
- No deviations from requirements
- Salinity controls were run
- Sample water salinity for
    - Test 1 was 7ppt
    - Test 2 was 2.6 ppt
    - Test 3 was 5.2ppt

iv. Date and time for start of definitive test
- Test 1 Saturday July 10, 2004 – 1730h (within 3 days)
- Test 2 Friday July 30, 2004 – 1500h (within 3 days)
- Test 3 Tuesday August 27, 2004 – 1230h (within 3 days)

v. **Date for test completion
- Test 1 July 17, 2004
- Test 2 August 6, 2004
- Test 3 September 3, 2004

vi. Test vessel description
- For all tests was a 600mL beaker

vii. Person(s) performing the test and verifying the results

Reporting Requirements for Reference Method EPAW 95-EPA West Coast (Topsmelt)

- Test 1: Testing by: Andy Diewald, Anja Fouche, Keven Goodearle, Ann-Marie Norris and Jenny Shao; Statistical analyses by Jenny Shao and QA/QC by Julianna Kalokai
- Test 2: Testing by: Andy Diewald, Ann-Marie Norris and Jenny Shao; Statistical analysis by Jenny Shao and Kathryn Sentance; QA/QC by Armando Tang
- Test 3: Testing by Andy Diewald, Anja Fouche and Jenny Shao; Statistics by Jenny Shao and Kathryn Sentance; QA/QC by Julianna Kalokai

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent

- Test 1: pH 8.1, T 19.5 °C, DO 9.3 mg/L, C 11660 µmhos/cm
- Test 2: pH 7.8, T 20.0 °C, DO 10.7 mg/L, C 4880 µmhos/cm
- Test 3: pH 7.6, T 20.0 °C, DO 10.1 mg/L, C 9230 µmhos/cm

ix. Confirmation that no adjustment of sample or solution pH occurred

- No pH adjustment

x. Indication of aeration of test solutions before introduction of fish

- Pre-aeration at 6.5mL/min/L for 30mins due to supersaturation of sample with O_2 when sample was heated to 19°C

xi. **Indication that EC guidance document for salinity adjustment was followed

- The following was done for all 3 tests:
    - No deviations from EC guidance document on preparation of hypersaline brine (HSB)
    - HSB prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 µm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
    - No deviations from EC guidance document for salinity adjustment of sample
    - HSB was added to samples to salinity adjust them to 30ppt
    - For a 200mL volume the concentrations were prepared by adding:
        - Test 1: 145mL of effluent + 55mL of HSB for the highest concentration. This solution was then diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).
        - Test 2: 138mL of effluent + 62mL of HSB for the highest concentration. This solution was then diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).
        - Test 3: 142mL of effluent + 58mL of HSB for the highest concentration. This solution was then diluted using natural seawater to make the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).

xii. Type and source of control/dilution water

- For all 3 tests, control/dilution water was UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xiii. Concentrations and volumes tested:

- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- For Test 1:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.5% - 200mL
    - 9.1% - 200mL
    - 18.2% - 200mL

Reporting Requirements for Reference Method EPAW 95-EPA West Coast (Topsmelt)

- 36.3% - 200mL
- 72.6% - 200mL

- For Test 2:
  - Control (0%) - 200 mL
  - Salinity Control (0%) - 200 mL
  - 4.3% - 200mL
  - 8.6% - 200mL
  - 17.3% - 200mL
  - 34.5% - 200mL
  - 69.0% - 200mL
- For Test 3:
  - Control (0%) - 200 mL
  - Salinity Control (0%) - 200 mL
  - 4.4% - 200mL
  - 9.0% - 200mL
  - 18.0% - 200mL
  - 36.0% - 200mL
  - 71.0% - 200mL

xiv. Number of replicated per concentration
- For all 3 tests: 5 replicates per concentration

xv. Number of organisms added to each test vessel
- For all 3 tests: 5 fish per vessel

xvi. Manner and rate of exchange of test solutions
- For all 3 test: Daily renewal

xvii. **Measurements of dissolved oxygen, pH and temperature, and salinity for each 24 hr period
- Test 1: See attached photocopied pages 1.1 and 1.2 of original laboratory report
- Test 2: See attached photocopied pages 2.1 and 2.2 of original laboratory report
- Test 3: See attached photocopied pages 3.1 and 3.2 of original laboratory report

Results

i. **Number and % of mortalities of fish in each test solution. Note that this data is presented in units of number of SURVIVORS and % MORTLITY. (Data is entered from original handwritten tables in lab reports)
- Test 1: Totals from all 5 replicates are presented (see attached pages 1.3-1.4 for original lab data):

Concentration		Number of Survivors - Day of Test							% Mortality on the Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	4	4	4	0	0	0	0	20	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Brine Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
4.5%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0

Reporting Requirements for Reference Method EPAW 95-EPA West Coast (Topsmelt)

Concentration		Number of Survivors - Day of Test							% Mortality on the Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
9.1%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
18.2%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
36.3%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	4	4	4	4	4	4	4	20	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
72.6%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20

- Test 2: Totals from all 5 replicates are presented (see attached pages 2.3-2.4 for original lab data):

Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Brine Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
4.3%	A	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
8.6%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0

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Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
17.3%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
34.5%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
69.0%	A	5	5	5	5	4	4	4	0	0	0	0	20	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0

- Test 3: Totals from all 5 replicates are presented (see attached pages 3.3-3.4 for original lab data):

Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Brine Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
4.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
9.0%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
18.0%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
36.0%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	4	0	0	0	0	0	0	20

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Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
71.0%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0

ii. **Average dry weight (mg) per original fish in test vessel. No preservation of fish was used. Fish were dried and then weighed.

- Test 1: Mean dry weight (mg) of each replicate and overall means are presented:

Concentration	Replicate					Overall Mean	Standard Deviation
(% effluent v/v)	1	2	3	4	5		
Neg Control (0%)	1.2120	1.0040	0.7980	0.7880	0.8460	0.9296	0.1800
Salinity Control	1.1300	0.8540	1.3000	1.1120	0.9940	1.0780	0.1661
4.5%	0.9500	0.9440	0.9500	1.1360	1.0260	1.0012	0.0826
9.1%	1.0520	1.0060	0.9040	1.0820	1.1360	1.0360	0.0876
18.2%	1.1100	0.9080	0.9340	0.9140	0.9160	0.9564	0.0864
36.3%	1.0560	1.2980	0.9260	1.0120	1.2220	1.1028	0.1533
72.6%	0.9560	1.3320	0.8120	0.8060	1.0460	0.9904	0.2161

- Test 2: Mean dry weight (mg) of each replicate are presented:

Concentration	Replicate						
(% effluent v/v)	1	2	3	4	5	Overall Mean	Standard Deviation
Neg Control (0%)	1.000	1.122	0.952	0.962	0.866	0.9804	0.0931
Salinity Control	1.170	0.812	1.042	0.880	1.030	0.9868	0.1418
4.3%	0.754	1.078	1.064	0.814	0.840	0.9100	0.1503
8.6%	1.098	0.866	0.884	0.726	0.778	0.8704	0.1426
17.3%	0.710	0.794	0.944	0.596	0.872	0.7832	0.1363
34.5%	0.912	0.874	0.918	0.854	0.924	0.8964	0.0307
69.0%	0.486	0.818	0.756	0.808	1.000	0.7736	0.1854

- Test 3: Mean dry weight (mg) of each replicate are presented:

Concentration	Replicate						
(% effluent v/v)	1	2	3	4	5	Overall Mean	Standard Deviation
Neg Control (0%)	0.9680	0.9700	0.9780	0.8460	0.8940	0.9312	0.0585
Salinity Control	0.9040	0.8600	1.2680	0.9720	0.8080	0.9624	0.1811
4.4%	0.9380	1.5180	1.0220	0.8620	0.9420	1.0564	0.2642
9.0%	0.8960	0.8600	0.9480	0.7900	0.8320	0.8652	0.0604
18.0%	0.9240	0.6960	1.1280	1.0860	0.9940	0.9656	0.1704
36.0%	1.0900	0.8140	0.7880	1.0300	0.8900	0.9224	0.1328
71.0%	0.6680	0.7620	1.0920	0.9280	0.9060	0.8712	0.1631

iii. Estimate of 7-d LC_{50} (95% CL)

- Test 1: 7-d LC_{50} concentration > 72.6% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d LC_{50} concentration > 69.0% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 3: : 7-d LC_{50} concentration > 71.0% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

iv. Estimate of 7-d IC_{25} (95% CL) for growth

Reporting Requirements for Reference Method EPAW 95-EPA West Coast (Topsmelt)

- Test 1: 7-d IC_{25} concentration > 72.6% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d IC_{25} concentration > 69.0% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 3: 7-d IC_{25} concentration > 71.0% effluent (highest concentration tested due to dilution for salinity adjustment)

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1 :Reference toxicity tests for Toxicant: Copper
  - Test conducted on July 10, 2004, same day as effluent test
  - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
  - 7-d LC_{50} survival = 161mg/L Cu, 95% CL = 139-188mg/L
  - 7-d IC_{50} growth = 147mg/L Cu, 95% CL = 119-169mg/L
- Test 2 :Reference toxicity tests for Toxicant: Copper
  - Test conducted on July 30, 2004, same day as effluent test
  - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
  - 7-d LC_{50} survival = 130mg/L Cu, 95% CL = 115-147mg/L
  - 7-d IC_{50} growth = 124mg/L Cu, 95% CL = 87-144mg/L
- Test 3 :Reference toxicity tests for Toxicant: Copper
  - Test conducted on August 27, 2004, same day as effluent test
  - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
  - 7-d LC_{50} survival = 121mg/L Cu, 95% CL = 107-137mg/L
  - 7-d IC_{50} growth = 128mg/L Cu, 95% CL = 85-150mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1: Reference toxicity tests for Toxicant: Copper
  - 7-d LC_{50} survival = 137 ± 56mg/L Cu
  - 7-d IC_{50} growth = 135 ± 51mg/L Cu
- Test 2: Reference toxicity tests for Toxicant: Copper
  - 7-d LC_{50} survival = 129 ± 48mg/L Cu,
  - 7-d IC_{50} growth = 130 ± 52mg/L Cu
- Test 3: Reference toxicity tests for Toxicant: Copper
  - 7-d LC_{50} survival = 132 ± 48mg/L Cu,
  - 7-d IC_{50} growth = 131 ± 51mg/L Cu

APPENDIX B

92-h Echinoderm Fertilization Test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75^{o} 22' 32" N, 97^{o} 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 - Wednesday July 7, 2004 – 1100h
     Test 2 - Tuesday July 27, 2004 – 2130h
     Test 3 – Tuesday Aug 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) Tests 1 & 2
   - Patrick Allard (Azimuth) Test 3

x. **Labeling/coding of sample (Sample IDs)
   - Test 1 - G-Creek_sub_070704
   - Test 2 - G-Creek_Sublethal_270704
   - Test 3 – G-Creek_081704

xi. **Date & time of sample receipt
   - Samples for sublethal toxicity testing were collected:
     Test 1 - Saturday July 10, 2004 – 1425h
     Test 2 - Friday July 30, 2004 – 1200h
     Test 3 – Friday Aug 27, 2004 – 0945h

xii. **Temperature upon sample receipt at laboratory
   - Test 1 – n/a no test
   - Test 2 – 13.0 °C
   - Test 3 – 15.4 °C

Test Organisms

i. Species of test organism
   - Sandollar Echinoid (*Dendraster excentricus*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - M-REP, Escondido, California
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - Test 1: Test was not initiated due to inability of the Sandollars to spawn.
   - Test 2: July 30, 2004
   - Test 3: August 27, 2004

v. Holding time and conditions for adults
   - Test 1: N.A.

- Test 2: Adults received at the testing laboratory the day of the test.
- Test 3: Adults received at the testing laboratory the day of the test.

vi. Indications of deviations from EC guidance on the importation of test organisms
- Test 1: na
- Test 2: No deviations from EC requirements
- Test 3: No deviations from EC requirements

vii. Weekly percent mortality of adults being held over 7d preceding test
- Test 1: na
- Test 2: <2% per day over the 7 days preceding the test
- Test 3: <2% per day over the 7 days preceding the test

viii. Age of test organisms
- Test 1: n.a.
- Test 2: < 4 hours after spawning
- Test 3: < 4 hours after spawning

ix. **Unusual appearance, behaviour, or treatment of adults or gametes before test start, or anything unusual about the test
- Test 1: Test was not initiated due to inability of the Sandollars to spawn
- Test 2 Organisms appear healthy, in good condition, nothing unusual about test organisms or test
- Test 3: Organisms appear healthy, in good condition, nothing unusual about test organisms or test

Test Facilities and Conditions

i. Test type & method
- Echinoderm (*Dendraster excentricus*) Fertilization Toxicity Test
- Static
- Reference Method – EPS/1/RM/27 with 1997 amendments

ii. Test duration
- Test 1: na
- Test 2: 10:10 min (10min sperm + 10min sperm & egg)
- Test 3: 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test
- Test 1: na
- Test 2: Friday July 30, 2004 – 1620h
- Test 3: Friday August 27, 2004 – 1334h

iv. Test vessel description
- Test 1: na
- Test 2: 16 x 125mm test tubes
- Test 3: 16 x 125mm test tubes

v. Person(s) performing the test and verifying the results
- Test 1: na
- Test 2: Testing by Kathryn Sentance and Ann-Marie Norris. Statistical analyses by Jenny Shao and Kathryn Sentance. QA/QC reviewed by Julianna Kalokai.
- Test 3: Testing by Kathryn Sentance and Ann-Marie Norris. Statistical analyses by Jenny Shao and Kathryn Sentance. QA/QC reviewed by Julianna Kalokai.

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- Test 1: na
- Test 2: No pre-aeration noted.
- Test 3: No pre-aeration noted.

vii. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: na

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Test 2: No pH adjustment
- Test 3: No pH adjustment

viii. Procedure for sample filtration
- Test 1: na
- Test 2: No sample filtration
- Test 2: No sample filtration

ix. **Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997
- Test 1: na
- Test 2: Hypersaline brine (HSB) was prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine). HSB was added to samples to salinity adjust them to 30ppt. For a 10mL volume the concentrations were prepared by adding 7.31mL of effluent + 2.69mL of HSB for the highest concentration. This solution was diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions). No deviations from EC guidance document (July 1997) for salinity adjustment of sample.
- Test 2: Hypersaline brine (HSB) was prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine). HSB was added to samples to salinity adjust them to 30ppt. For a 10mL volume the concentrations were prepared by adding 7.51mL of effluent + 2.49mL of HSB for the highest concentration. This solution was diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions). No deviations from EC guidance document (July 1997) for salinity adjustment of sample.

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment
- Test 1: na
- Test 2: salinity adjusted from 2.8 to 28 ppt
- Test 3: salinity adjusted from 5 to 28 ppt

xi. Type and source of control/dilution water
- Test 1: na
- Test 2: UV-sterilized, 0.45μm-filtered natural seawater from the Vancouver Aquarium
- Test 3: UV-sterilized, 0.45μm-filtered natural seawater from the Vancouver Aquarium

xii. Concentrations and volumes tested
- Test 1: na
- Test 2: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.6% - 10mL
    - 9.1% - 10mL
    - 18.3% - 10mL
    - 36.6% - 10mL
    - 73.1% - 10mL
- Test 3: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.7% - 10mL
    - 9.4% - 10mL

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- 18.8% - 10mL
- 37.5% - 10mL
- 75.1% - 10mL

xiii. Number of replicated per concentration
- Test 1: na
- Test 2: 4 replicates per treatment concentration
- Test 3: 4 replicates per treatment concentration

xiv. **Number of organisms per container
- Test 1: na
- Test 2: 2000 eggs per vessel (100 counted)
- Test 3: 2000 eggs per vessel (100 counted)

xv. Measurements of pH and dissolved oxygen in sample water before use
- Test 1: na
- Test 2: pH 8.1, DO 8.5
- Test 3: pH 8.0, DO 8.5

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- Test 1: na
- Test 2: pH – 8.0 – 8.1, T - 15.0-16.0°C, DO - 8.2-8.5mg/L, salinity - 28ppt
- Test 3: pH – 8.2 – 8.5, T - 15.0-16.0°C, DO - 8.2-8.5mg/L, salinity - 28ppt

Results

i. Number and % of fertilized eggs in each test concentration
- Test 1: na
- Test 2: (Number is equal to percent since totals were 100)
  - Control (0%): #F = 59, 62, 56, 65 #UF = 41, 38, 44, 35
  - Salinity Control: #F = 60, 57, 59, 62 #UF = 40, 43, 41, 38
  - 4.6%: #F = 60, 66, 56, 58 #UF = 40, 34, 44, 42
  - 9.1%: #F = 46, 42, 45, 42 #UF = 54, 58, 55, 58
  - 18.3%: #F = 39, 39, 37, 36 #UF = 61, 64, 63, 64
  - 36.6%: #F = 31, 34, 25, 31 #UF = 69, 66, 75, 69
  - 73.1%: #F = 19, 20, 21, 20 #UF = 81, 80, 79, 80
- Test 3: (Number is equal to percent since totals were 100)
  - Control (0%): #F = 77, 80, 74, 77 #UF = 23, 20, 26, 23
  - Salinity Control: #F = 76, 73, 79, 77 #UF = 24, 27, 21, 23
  - 4.7%: #F = 78, 74, 76, 72 #UF = 22, 26, 24, 28
  - 9.4%: #F = 61, 62, 62, 60 #UF = 39, 38, 38, 40
  - 18.8%: #F = 56, 58, 59, 55 #UF = 44, 42, 41, 45
  - 37.5%: #F = 49, 50, 50, 48 #UF = 51, 50, 50, 52
  - 75.1%: #F = 25, 27, 24, 27 #UF = 75, 73, 76, 73

ii. **Estimate of IC_{25} (95% CL) for fertilization success
- Test 1: na
- Test 2: IC_{25} concentration = 8.7 (7.6 – 9.9)% v/v effluent
- Test 3: IC_{25} concentration = 17.5 (11.6 – 22.6)% v/v effluent
- Quantitative statistic used to generate IC_{25} values was log-linear interpolation (200 resamples) calculated in ToxCalc v5.0.23 (Test 2) and log-logit interpolation (200 resamples) calculated in ToxCalc v5.0.23 (Test 3)

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization
- Test 1: na
- Test 2: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Test conducted on July 30, 2004, same day as effluent test
- Reference test conducted under same conditions
- IC_{50} for fertilization = 2.1mg/L SDS, 95% CL = (1.9 – 2.4)mg/L

- Test 3: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on August 27, 2004, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 2.3mg/L SDS, 95% CL = (2.1 – 2.4)mg/L

iv. Reference toxicant warning limits (+/- 2SD) for IC_{50} for fertilization

- Test 1: na
- Test 2: 4.2 +/- 4.8 mg/L SDS
- Test 3: 3.9 +/- 4.6 mg/L SDS

APPENDIX C

7-d Sublethal *Champia* (Algae) Toxicity Test

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Test 1 - Wednesday July 7, 2004 – 1100h
     Test 2 - Tuesday July 27, 2004 – 2130h
     Test 3 – Tuesday Aug 24, 2004 – 1500h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 1 x 4L sample bottles were filled

vi. Name of person submitting samples
   - Dennis Lu (Gartner Lee) Tests 1 & 2
   - Patrick Allard (Azimuth) Test 3

vii. Temperature of water upon receipt at lab
   - Test 1: Test was not conducted as sample was delayed by weather and person qualified to conduct the work at the lab left for vacation. This was discussed with Sandra Blenkinsopp at the time to provide direction.
   - Test 2: 8°C
   - Test 3: 17°C

xiii. **Labeling/coding of sample (Sample IDs)
   - Test 1 - G-Creek_sub_070704
   - Test 2 - G-Creek_Sublethal_270704
   - Test 3 – G-Creek_081704

xiv. **Date & time of sample receipt
   - Samples for sublethal toxicity testing were collected:
     Test 1 – n/a test not conducted
     Test 2 - Friday July 30, 2004 – 0900h
     Test 3 – Friday Aug 27, 2004 – 0900h

Test Organisms

i. Species of test organism
   - Algae (*Champia parvula*)

ii. Name and city of testing laboratory
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species and health of organisms
   - Test 1: na
   - Test 2 and Test 3
     - Sexually mature male and female branches
     - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
     - Appear in excellent health, healthy red color
     - Females have trichogynes, males have sori with spermatia

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

iv. **Any unusual appearance, behaviour, or treatment of test organisms, before their use in test
- Test 1: na
- Test 2 and Test 3
    - Nothing unusual about the appearance, behaviour, or treatment of test organisms, before their use in test; everything is normal
    - Nothing unusual about the tests

Test Facilities and Conditions

i. Test type & method
- *Champia parvula* sexual reproduction test
- Static, non-renewal
- 2-day exposure, followed by 5-7 day recovery period for cystocarp development
- Reference Method - EPA/600/4-91/003, Method 1009.0

ii. Date and time for start of definitive test
- Test 1: na
- Test 2: Friday July 30, 2004 – time not noted but lab notes state tests started within 72 hrs of collection
- Test 3: Friday August 27, 2004 – time not noted but lab notes state tests started within 72 hrs of collection

xviii. **Date for test completion
- Test 1 – n/a
- Test 2 – August 6, 2004
- Test 3 – September 3, 2004

iii. Test vessel description
- Test 1: na
- Test 2: 270mL transparent polystyrene cups with polystyrene lids
- Test 2: 270mL transparent polystyrene cups with polystyrene lids

iv. Person(s) performing the test and verifying the results
- Test 1: na
- Tests 2 & 3 - Mary Moody

v. Indication of pre-aeration of test solutions
- Test 1: na
- Tests 2 & 3 - No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
- Test 1: na
- Tests 2 & 3: - No pH adjustment

vii. **Indication that EC guidance document for salinity adjustment was followed
- Test 1: na
- Test 2:
    - No deviations from EC guidance document on preparation of hypersaline brine (May 2001)
    - HSB prepared from natural seawater at 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
    - No deviations from EC guidance document for salinity adjustment of sample
    - Salinity adjustment: 600mL effluent + 250mL HSB + 8.5mL test nutrient solution
    - Salinity of samples adjusted from 4ppt to 30ppt
- Test 3:

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

- No deviations from EC guidance document on preparation of hypersaline brine (May 2001)
- HSB prepared from natural seawater at 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
- No deviations from EC guidance document for salinity adjustment of sample
- Salinity adjustment: 600mL effluent + 230mL HSB + 10 ml test nutrient solution
- Salinity of samples adjusted from 5ppt to 30ppt

viii. Type and source of control/dilution water

- Test 1: na
- Tests 2 & 3
  - Natural seawater collected at the Pacific Environmental Center, Environment Canada, North Vancouver, BC
  - Filtered to 0.2μm and autoclaved prior to use
  - Salinity adjusted as per EC guidance document to 30ppt with HSB from the same source

ix. **Type and quantity of any chemicals added to the control dilution water

- Test 1: na
- Test 2: Test nutrients as described in Test Method USEPA/600/4-91/003, Method 1009.0 were added at concentration of 10mL/L, analytical grade, 8.5mL added
- Test 3: Test nutrients as described in Test Method USEPA/600/4-91/003, Method 1009.0 were added at concentration of 10mL/L, analytical grade, 10mL added

x. Concentrations and volumes of test solutions

- Concentrations (% effluent volume / total volume) tested and total volumes used were:
  - Test 1: na
  - Tests 2:
    - Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
    - Salinity Control Brine (0%) - 100mL, 4.5cm depth
    - 4.38% - 100mL, 4.5cm depth
    - 8.75% - 100mL, 4.5cm depth
    - 17.5% - 100mL, 4.5cm depth
    - 35.0% - 100mL, 4.5cm depth
    - 70.0% - 100mL, 4.5cm depth
  - Tests 3:
    - Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
    - Salinity Control Brine (0%) - 100mL, 4.5cm depth
    - 4.5% - 100mL, 4.5cm depth
    - 9.0% - 100mL, 4.5cm depth
    - 18.0% - 100mL, 4.5cm depth
    - 36.0% - 100mL, 4.5cm depth
    - 72.0% - 100mL, 4.5cm depth

xi. Number of replicated per concentration

- Test 1: na
- Tests 2 & 3: 3 replicates per concentration

xii. Number of organisms per test chamber

- Test 1: na
- Tests 2 & 3: 5 female branches + 2 male branches per chamber

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

- Test 1: na
- Test 2: pH - 7.78, T – 22.0 °C, DO – 7.9mg/L, salinity - 4ppt
- Test 3: pH - 7.58, T – 23.0 °C, DO – 8.0mg/L, salinity - 5ppt

xiv. **Measurements of pH, temperature, dissolved oxygen, and salinity of test solution and controls at 0hr, 48hr, and the beginning and end of recovery period

- Test 1: na
- Test 2:

Concentration (% v/v)	Temperature (°C)				Dissolved Oxygen (mg/L)				pH (pH units)				Salinity (ppt)			
	Exposure		Recovery		Exposure		Recovery		Exposure		Recovery		Exposure		Recovery	
	0	48	0	end	0	48	0	end	0	48	0	end	0	48	0	end
Control-NSW[1]	22	23	22	23	7.9	7.9	8.0	7.9	8.20	8.35	8.33	8.22	30	30	30	30
Control-brine	22	23	22	23	7.9	7.9	8.0	7.9	7.93	8.20	8.34	8.21	30	30	30	30
A 70	22	23	22	23	7.9	7.9	8.0	7.9	7.80	8.40	8.34	8.26	30	30	30	30
C 17.5	22	23	22	23	7.9	7.9	8.0	7.9	8.15	8.31	8.34	8.36	30	30	30	30
E 4.38	22	23	22	23	7.9	7.9	8.0	7.9	8.19	8.36	8.34	8.21	30	30	30	30

[1]NSW = natural seawater

- Test 3:

Concentration (% v/v)	Temperature (°C)				Dissolved Oxygen (mg/L)				pH (pH units)				Salinity (ppt)			
	Exposure		Recovery		Exposure		Recovery		Exposure		Recovery		Exposure		Recovery	
	0	48	0	end	0	48	0	end	0	48	0	end	0	48	0	end
Control-NSW[1]	23	23	23	23	7.9	7.9	8.0	7.9	8.34	8.61	8.22	8.37	30	30	30	30
Control-brine	23	23	23	23	7.9	7.9	8.0	7.9	7.92	8.52	8.22	8.42	30	30	30	30
A 70	23	23	23	23	8.0	7.9	8.0	7.9	7.83	8.52	8.22	8.44	30	30	30	30
C 17.5	23	23	23	23	7.9	7.9	8.0	7.9	8.21	8.29	8.21	8.41	30	30	30	30
E 4.38	23	23	23	23	7.9	7.9	8.0	7.9	8.32	8.42	8.22	8.39	30	30	30	30

[1]NSW = natural seawater

Results

i. Number and % mortality of female plants after recovery in each test solution

- Totals from all 3 replicates are presented:
- Test 1: na
- Test 2:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 4.38%: 0 (0%) mortality
  - 8.75%: 0 (0%) mortality
  - 17.5%: 0 (0%) mortality
  - 35.0%: 0 (0%) mortality
  - 70.0%: 0 (0%) mortality
- Test 3:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 4.5%: 0 (0%) mortality
  - 9.0%: 0 (0%) mortality
  - 18.0%: 0 (0%) mortality
  - 36.0%: 0 (0%) mortality
  - 72.0%: 0 (0%) mortality

ii. **Mean number of cystocarps per plant in each replicate of each test concentration

- Test 1: na
- Test 2: (Replicates are A, B, and C)
  - Control (0%): A) 89.6, B) 89.8, C) 96.8
  - Salinity Control (0%): A) 86.2, B) 93.4, C) 98.0

- 4.38%: A) 114.8, B) 101.0, C) 99.6
- 8.75%: A) 108.4, B) 105.8, C) 101.0
- 17.5%: A) 81.6, B) 90.2, C) 100.2
- 35.0%: A) 54.4, B) 64.2, C) 67.0
- 70.0%: A) 9.6, B) 9.0, C) 21.4

- Test 3: (Replicates are A, B, and C)
  - Control (0%): A) 55.2, B) 62.0, C) 57.6
  - Salinity Control (0%): A) 50.8, B) 70.4, C) 55.6
  - 4.5%: A) 61.4, B) 50.8, C) 67.0
  - 9.0%: A) 63.0, B) 56.0, C) 61.0
  - 18.0%: A) 68.6, B) 53.2, C) 61.0
  - 36.0%: A) 53.8, B) 48.6, C) 51.6
  - 72.0%: A) 31.2, B) 36.4, C) 11.2

iii. **Estimate of IC_{25} (95% CL) for cystocarp development

- Test 1: na
- Test 2: IC_{25} concentration = 26.6 (20.8 – 31.5)% effluent v/v
- Test 3: IC_{25} concentration = 45.3 (36.3 – 58.1)% effluent v/v
  - Quantal statistic method was linear interpolation (200 resamples) determined using ToxCalc v5.0.23

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test 1: na
- Test 2: Test conducted on July 27, 2004, within 30 days of effluent test
  - Reference toxicant test was conducted under the same experimental conditions as the effluent test
  - IC_{50} cystocarp development = 1.48mg/L SDS, 95% CL = (1.38 - 1.62) mg/L
  - Reference toxicity warning limits 1.40 (+/- 2SD) for IC_{50} for cystocarp development
- Test 3: Test conducted on July 27, 2004, within 30 days of effluent test
  - Reference toxicant test was conducted under the same experimental conditions as the effluent test
  - IC_{50} cystocarp development = 1.48mg/L SDS, 95% CL = (1.38 - 1.62) mg/L
  - Reference toxicity warning limits 1.40 (+/- 2SD) for IC_{50} for cystocarp development

v. Reference toxicant warning limits (+/- 2SD) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test 1: na
- Test 2: 1.40 (1.6-1.70) mg/L SDS
- Test 3: 1.40 (1.6-1.70) mg/L SDS

Note that Pages 1.1-1.4, 2.1-2.4, 3.1-3.4 are included in the hardcopy paper report only. This data can also be found in Appendix E. Note that the champia test lab reports are only included in the hardcopy paper report, not in this pdf.

APPENDIX D

Acute Toxicity Testing Laboratory Reports

EVS environment consultants

July 21, 2004

Our File: 09-0302-54.00
Work Order: 0400304/307

Cheryl Mackintosh
Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Dear Ms. Mackintosh:

RE: Acute Toxicity Test Results for a sample collected July 7, 2004

We are pleased to provide you with the results of the toxicity tests performed on the sample identified as G-Creek acute 070704 (received July 10, 2004). The sample was tested with the 96-h rainbow trout LC50 test and the 48-h *Daphnia magna* LC50 test. Testing was performed according to the Environment Canada protocols for conducting acute toxicity tests using rainbow trout (EPS 1/RM/13, Second Edition, 2000) and *D. magna* (EPS 1/RM/14, Second Edition, 2000). An independent EVS QA/QC review confirmed that all acceptability criteria specified by the protocols were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Table 1. Toxicity Test Results.

Sample ID	Sample Date (Time h)	96-h Rainbow Trout LC50 (95% CL) (% v/v)	48-h *Daphnia magna* LC50 (95% CL) (% v/v)
G-Creek acute 070704	7-July-04 (2200h)	>100	>100

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Sincerely,

Robert Harrison, B.Sc. Hons.
Assistant Bioassay Test Supervisor– Fish Team
rharrison@evsenvironment.com

Verified By:

QA/QC Committee:
Armando Tang, B.Sc.
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.
John Wilcockson, M.Sc.

195 Pemberton Ave.
North Vancouver, BC
Canada V7P 2R4

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Fax: 604.662.8548
www.evsenvironment.com
info@evsenvironment.com

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: (Polaris) Azimuth
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400304
EVS Analysts: RGH, AWD
Test Type: 96h LC50
Test Initiation Date: July 12/04 @ 1445

SAMPLE
Identification: G-Creek acute 070704
Amount Received: 2 x 20L
Date Collected: July 7 /04
Date Received: July 10 /04
Other:

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 15.0
pH: 7.4
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 37
Hardness (mg/L as $CaCO_3$): 12
Alkalinity (mg/L as $CaCO_3$): 12
Other:

TEST SPECIES INFORMATION
Source: Fraser Valley
Collection Date/Batch: 052604
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: July 16 /04
Fork Length (mm): 34±2 (29-37)
Wet Weight (g): 0.39±0.09 (0.22-0.54)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: June 21 /04
Duration of Acclimation (days): 26
96-h LC50 (and 95% CL): 23 (20 and 25) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29±12 mg/L SDS CV: 21%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.3 - 10.1
Temperature Range (°C): 14.0 - 15.0
pH Range: 7.0 - 8.3
Conductivity Range (µS/cm): 37 - 11843
Aeration Provided? (give rate): 6.5±1 mL/min/L
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/10L
Loading Density (g/L): 0.39
Acclimation Before Testing (days): 47
Mortality In Previous Week of Acclimation (%): 0
Other:

TEST RESULTS The 96h LC50 is estimated at > 100% (v/v)

Data Verified By: Amanda Terry
Date Verified: August 5, 2004

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	14		14
pH	8.1		8.1
DO (mg/L)	10.0		10.1
Cond. (µS/cm)	11730		11730

1. Document pH adjustment procedure (if used) under "Comments".

Total Pre-Aeration Time 30 min

Client Azimuth (Polaris)
EVS Project No. 09-0302-54
EVS Work Order No. 0400304
Trout Batch No. and 7-d Acclimation Mortality 052604/0%
No. Fish/Volume 10/10L
Sample ID CT-Creek acute 070704
Date/Time Collected July 7/04
Test Initiation Date/Time July 12/04 @ 1445

Concentration % (v/v)	Number of Survivors (1 to 96 hours)							Dissolved Oxygen (mg/L)					Temperature (°C)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Control				10	10	10	10	10.1	9.5	9.8	9.8	10.0	15.0	15.0	15.0	15	15	7.4	7.3	7.0	7.2	7.1	37	43
6.25				10	10	10	10	10.1	9.5	9.6	9.7	9.8	15.0	15.0	15.0	15	15	7.6	7.3	7.1	7.1	7.2	1520	1543
12.5				10	10	10	10	10.1	9.6	9.3	9.7	9.9	14.5	15.0	15.0	15	15	7.8	7.5	7.3	7.4	7.4	2270	2300
25				10	10	10	10	10.1	9.7	9.8	9.6	9.9	14.5	15.0	15.0	15	15	7.9	7.6	7.5	7.6	7.7	3660	3700
50				10	10	10	10	10.1	9.6	9.7	9.7	9.9	14.5	15.0	15.0	15	15	8.0	7.8	7.7	7.8	7.9	6070	6120
100				10	10	10	10	10.1	9.8	9.8	9.7	9.9	14.0	15.0	15.0	15	15	8.1	8.3	8.2	7.9	8.1	11730	11843
Technician Initials				RLH	RLH	~	~	RLH	RLH	RLH	~	~	RLH	RLH	RLH	~	~	RLH	RLH	RLH	~	~	RLH	~

WQ Instruments Used: Temperature Calibrated Hg Thermometer pH II-A-030302 DO II-A-3 Conductivity II-A-030306
Sample Description cloudy white/grey
Comments

Test Set Up By RLH Data Verified By Amanda Tang Date Verified July 30, 2004

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth (Polaris) | EVS Analysts: AKN JRY
EVS Project No.: 09-0302-54 | Test Type: 48hr - LC50
EVS Work Order No.: 0400307 | Test Initiation Date: July 11, 2004

SAMPLE INFORMATION

Identification: G-Creek. 070704
Amount Received: 1 x 2L subsampled from 2x20L @ EVS
Date Collected: July 7, 2004
Date Received: 10 July 2004
Temperature (°C): 22.0 → 20.0
pH: 7.9 → 7.8
pH adjustment details: None.
Dissolved Oxygen (mg/L): 11.4 → 9.1
Pre-aeration rate and duration: @ aerated 8 min
Conductivity (µmhos/cm): 11850
Hardness (mg/L as $CaCO_3$): 1440
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

DILUTION/CONTROL WATER (initial water quality)

Water Type: Moderately Hard H_2O (July 7B)
Temperature (°C): 20.0
pH: 8.0
Dissolved Oxygen (mg/L): 9.1
Conductivity (µS/cm): 357
Hardness (mg/L as $CaCO_3$): 98
Alkalinity (mg/L as $CaCO_3$): 66
Other: —

TEST SPECIES INFORMATION

Broodstock Culture ID (in-house culture): June 15A+B
Age (on Day 0): <24h
Days to First Brood: 8
Avg. Young/Brood (after 1st brood): 27.5
% Mortality in 7 d Before Test: ~~11.8%~~ 9.5%
Reference Toxicant: Zinc
Current Reference Toxicant Result
Reference Toxicant Test Date: July 6, 2004
48-h LC50 and 95% CL: 483 (403 - 578) mg/L Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
462 ± 315 mg/L Zn % CV = 34

TEST CONDITIONS

Temperature Range (°C): 20.0 - 21.5
pH Range: RBA 7.7-8 - 8.2
Dissolved Oxygen Range (mg/L): 8.6 - 9.1
Conductivity Range (µS/cm): 357 - 11850
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200mL
Other: —

TEST RESULTS The 48h LC50 for G-Creek 070704 is > 100% (v/v).

Data Verified By: Amanda Tang | Date Verified: August 5, 2004

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client: Azimuth – Polaris
Sample ID: G-Creek. 070704
EVS Project No.: 09-0302-54
Date Collected: July 7, 2004
EVS Work Order No.: 0400309
Test Initiation Date/Time: July 11th/04 @ 1400
Daphnid Broodstock Batch: June 15A
No. Organisms/Volume: 10/200mL.

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
CONTROL				10	10	9.1	8.8	8.6	20.0	21.0	21.5	8.0	7.7	7.7	357	~~357~~ 358
6.25				10	10	9.1	8.8	8.7	20.0	21.0	21.0	8.0	7.8	7.8	1231	1206
12.5				10	10	9.1	8.8	8.8	20.0	21.0	21.0	8.0	7.9	7.9	2020	2000
25				10	10	9.1	8.8	8.8	20.0	21.0	21.0	7.9	7.9	8.0	3630	3600
50				10	10	9.1	8.8	8.8	20.0	21.0	21.0	7.9	8.0	8.1	6370	6270
100				10	7	9.1	8.8	8.8	20.0	21.0	21.0	7.8	8.0	8.2	11850	11640
Technician Initials				AM	AM	AW	AM	AM	AW	AM	AM	AW	AM	AM	AW	AM

Sample Description: Clear colourless
WQ Instruments Used: Temp. Calibrated Hg Thermometer pH II-A-020502 DO II-A-011201 Cond. II-A-990501
Comments:

Test Set Up By: AKN Data Verified By: Armando Tang Date Verified: August 5, 2004

AZIMUTH (POLARIS)

CHAIN-OF-CUSTODY/TEST REQUEST FORM

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

Tel: (604) 986-4331
Fax: (604) 662-8548
www.evsenvironment.com

Client Name: Teck Cominco
Client Contact: Bruce Donald
Ship to:

Address: Bag 2000
Kimberley, BC
V1A 3E9
Phone: 250 427-8405
Fax: 250 427.8451
Sampled by: Dennis Lu
Attn:
Shipping Date:

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (√)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	3 Sample Container Type by Code	Test(s) Requested: 96hr LC50 Rainbow Trout	Test(s) Requested: Tajima / Ceriodaphnia	Test(s) Requested: D. magna 48h LC50	Test(s) Requested	Test(s) Requested	4 Sample Notes (e.g. preserved, saltwater, freshwater, may contain sewage)
~~07/Jul/2004~~	~~22:00~~	~~G-Creek_070704~~											
07/Jul/2004	22:00	G-Creek_acute_070704	E		G	2x70L		X		X			
07/Jul/2004	22:00	G-Creek_sub_070704	E		G	3x70L			X				

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by:	Date:	2) Released by:	Date:
Company:	Time:	Company:	Time:
Courier name:		Courier name:	
1) Received: JGK	Date: 10 JUL 04	2) Received by:	Date:
Company: EVS	Time: 1425	Company:	Time:

Shaded area to be completed by EVS Laboratory upon sample receipt.

EVS Project No. 04-0302-54
EVS Work Order (WO) No. 0400302/303/304/307
EOH TOSM. RBT DAPH.
Condition Upon Receipt GOOD
Receipt Sample Temp. (C) 11.6°

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, yellow - accompany the shipment
Pink - kept by consignor (e.g., shipper)
Yellow - kept by consignee (e.g., receiver)
White - returned to consignor by consignee

Please see instructions for completion on back of form.

Revision Date: March 6, 2004

EVS environment consultants

August 9, 2004

Our File: 09-0302-54.00
Work Order: 0400342,348

Cheryl Mackintosh
Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Dear Ms. Mackintosh:

RE: Acute Toxicity Test Results for a sample collected July 27, 2004

We are pleased to provide you with the results of the toxicity tests performed on the sample identified as G-Creek acute 270704 (received July 27, 2004). The sample was tested with the 96-h rainbow trout LC50 test and the 48-h *Daphnia magna* LC50 test. Testing was performed according to the Environment Canada protocols for conducting acute toxicity tests using rainbow trout (EPS 1/RM/13, Second Edition, 2000) and *D. magna* (EPS 1/RM/14, Second Edition, 2000). An independent EVS QA/QC review confirmed that all acceptability criteria specified by the protocols were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Table 1. Toxicity Test Results.

Sample ID	Sample Date (Time h)	96-h Rainbow Trout LC50 (95% CL) (% v/v)	48-h *Daphnia magna* LC50 (95% CL) (% v/v)
G-Creek acute 270704	27-July-04 (2130h)	>100	>100

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Sincerely,

Rachel DeWynter, B.Sc.
Algal Bioassay Supervisor
rdewynter@evsenvironment.com

Verified By:

QA/QC Committee:
Armando Tang, B.Sc.
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.
John Wilcockson, M.Sc.

195 Pemberton Ave.
North Vancouver, BC
Canada V7P 2R4

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info@evsenvironment.com

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth - (Polaris)
EVS Project No.: 09-0302-54.01
EVS Work Order No.: 0400348
EVS Analysts: JRY, AWD
Test Type: 48h LC50
Test Initiation Date: July 30, 2004

SAMPLE INFORMATION

Identification: G-Creek 270704
Amount Received: 3 x 20L
Date Collected: July 27, 2004
Date Received: July 30, 2004
Temperature (°C): 22.0 @ 21.5
pH: 7.8 @ 8.0
Dissolved Oxygen (mg/L): 12.1 @ 8.8
Conductivity (µmhos/cm): 5020
Hardness (mg/L as $CaCO_3$): 590
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

pH adjustment details: none
①Pre-aeration rate and duration: 10 minutes gentle aeration

DILUTION/CONTROL WATER (initial water quality)

Water Type: Moderately Hard Water (July 29)
Temperature (°C): 20.0
pH: 7.8
Dissolved Oxygen (mg/L): 9.1
Conductivity (µS/cm): 363
Hardness (mg/L as $CaCO_3$): 96
Alkalinity (mg/L as $CaCO_3$): 56
Other: —

TEST SPECIES INFORMATION

Broodstock Culture ID (in-house culture): July 2B
Age (on Day 0): <24hrs.
Days to First Brood: 7
Avg. Young/Brood (after 1st brood): 24
% Mortality in 7 d Before Test: 6%
Reference Toxicant: ZnC
Current Reference Toxicant Result
Reference Toxicant Test Date: 27-Jul-04
48-h LC50 and 95% CL: 683 (578-807) mg/L Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
463 ± 315 mg/L Zn %CV=34

TEST CONDITIONS

Temperature Range (°C): 20.0 - 21.5
pH Range: 7.7 - 8.0
Dissolved Oxygen Range (mg/L): 8.6 - 9.1
Conductivity Range (µS/cm): 363 - 5020
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200ml
Other: —

TEST RESULTS The 48h LC50 of G-Creek 270704 is >100% (v/v)

Data Verified By: [signature]
Date Verified: Sept. 10/04

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client: Azimuth (Polaris) | Sample ID: G-Creek 270704
EVS Project No.: 04-0302-5401 | Date Collected: July 27, 2004
EVS Work Order No.: 0400348 | Test Initiation Date/Time: July 30, 2004 @ 14:00
Daphnid Broodstock Batch: July 2B | No. Organisms/Volume: 10/200ml

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
Control				10	10	9.1	8.9	8.7	20.0	21.0	21.0	7.8	8.1	7.9	363	374
6.25				10	10	9.0	8.9	8.6	20.5	21.0	21.0	7.8	8.1	7.8	688	680
12.5				10	10	8.9	8.8	8.7	21.0	21.0	21.0	7.9	7.7	7.7	990	984
25				10	10	8.9	8.8	8.7	21.0	21.0	21.0	7.9	7.7	7.7	1592	1586
50				10	10	8.9	8.6	8.7	21.0	21.0	21.0	7.9	7.6	7.8	2750	2690
100				10	10	8.8	8.7	8.6	21.5	21.0	21.0	8.0	7.7	7.7	5020	4940
Technician Initials				~	~	JM	~	~	JM	~	~	JM	~	~	JM	~

Sample Description: Clear, colourless
WQ Instruments Used: Temp. Calibrated Hg Thermometers pH II-A-020502 DO II-A-011201 Cond. II-A-990901
Comments:

Test Set Up By: JRY | Data Verified By: [illegible] | Date Verified: Sept 8/04

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400340 342 RSD
EVS Analysts: AWD
Test Type: 96h LC50
Test Initiation Date: Aug 1/04

SAMPLE
Identification: G-Creek acute 270704
Amount Received: 3x20L
Date Collected: July 27/04
Date Received: July 30/04
Other:

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 14
pH: 6.8
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 30
Hardness (mg/L as $CaCO_3$): 16
Alkalinity (mg/L as $CaCO_3$): 10
Other:

TEST SPECIES INFORMATION
Source: Fraser Valley
Collection Date/Batch: 070504
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: Aug 5/04
Fork Length (mm): 33 ± 2 (31-35)
Wet Weight (g): 0.34 ± 0.04 (0.29-0.42)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: July 23/04
Duration of Acclimation (days): 18
96-h LC50 (and 95% CL): 21 (17 and 26)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29 ± 12 mg/L SDS CV = 21%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.6 - 10.1
Temperature Range (°C): 14
pH Range: 6.8 - 8.3
Conductivity Range (µS/cm): 30 - ~~4860~~ RSD 4870
Aeration Provided? (give rate): 6.5 ± 1 mL/min/L
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/10L
Loading Density (g/L): 0.34
Acclimation Before Testing (days): 27
Mortality In Previous Week of Acclimation (%): 0.25
Other:

TEST RESULTS The 96-h LC50 was estimated to be > 100% (v/v)

Data Verified By: [signature]
Date Verified: Sept. 10/04

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	14		14
pH	7.6		7.7
DO (mg/L)	10.1		10.1
Cond. (µS/cm)	4810		4870

1. Document pH adjustment procedure (if used) under "Comments".

Total Pre-Aeration Time 30 min

Client Polaris Azimuth
EVS Project No. 09-0302-54
EVS Work Order No. 0400~~346~~342
Trout Batch No. and 7-d Acclimation Mortality 070504/0.25%
No. Fish/Volume 10/10L
Sample ID G-Creek
Date/Time Collected July 27/04 @ ~~2230~~ 2130
Test Initiation Date/Time Aug 1-04 @ 1030

Concentration % (v/v)	Number of Survivors (1 to 96 hours)							Dissolved Oxygen (mg/L)					Temperature (°C)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Control			10	10	10	10	10	10.1	9.8	9.6	9.7	9.9	14	14	14	14	14	68	71	74	72	73	38	41
6.25			10	10	10	10	10	10.1	9.8	9.6	9.7	9.7	14	14	14	14	14	71	74	75	74	72	~~360~~ 350	540
12.5			10	10	10	10	10	10.1	9.6	9.6	9.7	9.8	14	14	14	14	14	74	78	77	75	72	900	940
25			10	10	10	10	10	10.1	9.7	9.7	9.6	9.6	14	14	14	14	14	75	79	80	76	74	1670	1760
50			10	10	10	10	10	10.1	9.7	9.8	9.7	9.7	14	14	14	14	14	76	80	79	78	79	~~4840~~ 2020	2110
100			10	10	10	10	10	10.1	9.7	9.7	9.7	9.7	14	14	14	14	14	77	81	82	83	81	4870	4860
Technician Initials			~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~

WQ Instruments Used: Temperature Calibrated Hg Thermometer pH II-A-030302 DO II-A-3 Conductivity II-A-030306
Sample Description Clear
Comments

Test Set Up By ~ Data Verified By [illegible] Date Verified Sept. 10/04

CHAIN-OF-CUSTODY/TEST REQUEST FORM

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Client Name: Teck Cominco (Polaris) Client Contact Name: Cheryl. MacKintosh Ship to:

Address: Azimuth Consulting Group Phone: 604 730 9220

218-2902 West Broadway Fax: 604 739 8511

Vancouver B.C. Sampled By: Karlette Tinsley Attn: Shipping Date:

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	Type of Each Sample [1]	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab, C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	Sample Container Type by Code [2]	Tests Requested: 7D TOXMELT	RBT LC50 96H	48H ECHINODERM	48H DAPHNIA			Notes? (e.g. preserved, saltwater, freshwater, may contain sewage) [3]
For composite sample record date & time starting and ending														
27/07/04	9:30PM	G-Creek_Sublethal_270704	E			2x20L	HDPE	✓		✓				POLARIS PROJ
		G-Creek-Acute_270704	E			3x20L	HDPE		✓		✓			POLARIS PROJ

PO/Reference No.:

Project Title:

Results Needed By:

Comments/Instructions:

A) Released By: Date:
Company: Time:
Courier name:
Shipping containers secured by: Tape Straps Lock Other (circle one)
Custody seals used? Yes No

B) Received by: AWD Date: 30 JUL 04
Company: EVS Time: 12:00
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

C) Released By: Date:
Company: Time:
Courier name:
Shipping containers secured by: Tape Straps Lock Other (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify) HDPE Plastic
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

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EVS environment consultants

A member of the Golder group of companies

Golder Associates

Golder Associates Ltd.

195 Pemberton Avenue
North Vancouver, British Columbia
Canada V7P 2R4
Telephone 604-986-4331
Fax 604-662-8548

Our File: 09-0302-54.00
Work Order: 0400382,383

September 2, 2004

Cheryl Mackintosh
Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Dear Ms. Mackintosh:

RE: Acute Toxicity Test Results for a sample collected August 24, 2004

We are pleased to provide you with the results of the toxicity tests performed on the sample identified as G-Creek acute 081704 (received August 24, 2004). The sample was tested with the 96-h rainbow trout LC50 test and the 48-h *Daphnia magna* LC50 test. Testing was performed according to the Environment Canada protocols for conducting acute toxicity tests using rainbow trout (EPS 1/RM/13, Second Edition, 2000) and *D. magna* (EPS 1/RM/14, Second Edition, 2000). An independent EVS QA/QC review confirmed that all acceptability criteria specified by the protocols were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Table 1. Toxicity Test Results.

Sample ID	Sample Date (Time h)	96-h Rainbow Trout LC50 (95% CL) (% v/v)	48-h *Daphnia magna* LC50 (95% CL) (% v/v)
G-Creek acute 081704	24-Aug-04 (1500h)	>100	>100

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Sincerely,

Robert Harrison, B.Sc. Hons.
Assistant Bioassay Test Supervisor– Fish Team
rharrison@evsenvironment.com

Verified By:

QA/QC Committee:
Armando Tang, B.Sc.
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.
John Wilcockson, M.Sc.

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth (Polaris)
EVS Project No.: 09-1108-01.01
EVS Work Order No.: 0400383
EVS Analysts: JRY, ~~BLR~~ AWP
Test Type: 48hr LC50
Test Initiation Date: August 27, 2004

SAMPLE INFORMATION
Identification: G-Creek 081704
Amount Received: 1x2L subsampled @ EVS from 1x20L
Date Collected: August 24, 2004
Date Received: August 27, 2004
Temperature (°C): 23.0 ① 22.0
pH: 7.8 ① 8.1
Dissolved Oxygen (mg/L): 10.2 ① 8.7
Conductivity (µmhos/cm): 9320
Hardness (mg/L as $CaCO_3$): 1220
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

pH adjustment details: none
Pre-aeration rate and duration: 20 minutes

DILUTION/CONTROL WATER (initial water quality)
Water Type: Moderately Hard water (Aug 23)
Temperature (°C): 20.5
pH: 8.0
Dissolved Oxygen (mg/L): 9.0
Conductivity (µS/cm): 319
Hardness (mg/L as $CaCO_3$): 84 80
Alkalinity (mg/L as $CaCO_3$): 50
Other: —

TEST SPECIES INFORMATION
Broodstock Culture ID (in-house culture): Aug 6A
Age (on Day 0): <24hrs
Days to First Brood: 7
Avg. Young/Brood (after 1st brood): 21
% Mortality in 7 d Before Test: 0
Reference Toxicant: Zinc
Current Reference Toxicant Result
Reference Toxicant Test Date: August 24, 2004
48-h LC50 and 95% CL: 536 (438 - 656) µS/cm Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
481 ± 322 µS/cm Zn ; CV = 33

TEST CONDITIONS
Temperature Range (°C): 20.5 - 22.0
pH Range: 7.6 - 8.1
Dissolved Oxygen Range (mg/L): 8.5 - 9.0
Conductivity Range (µS/cm): 303 - 9320
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200ml
Other: —

TEST RESULTS The 48hr LC50 of G-Creek 081704 is > 100 % (v/v).

Data Verified By: [signature]
Date Verified: Nov. 16/04

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client Azimuth (Pobris)
EVS Project No. 04-1108-01.01
EVS Work Order No. 0400383
Daphnid Broodstock Batch Aug 6A

Sample ID G-Creek 081704
Date Collected August 24, 2004
Test Initiation Date/Time August 27/04 @ 11:00
No. Organisms/Volume 10/200ml

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
Control				10	10	9.0	8.8	8.7	20.5	21.0	21.5	8.0	7.6	7.7	319	305
6.25				10	10	9.0	8.7	8.7	20.5	21.5	21.5	8.0	7.6	7.7	919	924
12.5				10	10	9.0	8.7	8.6	20.5	21.5	21.5	8.0	7.7	7.8	1514	1551
25				10	10	9.0	8.7	8.6	20.5	21.5	21.5	8.0	7.6	7.8	2720	2810
50				10	10	8.9	8.6	8.5	21.0	21.5	21.5	8.0	7.7	7.8	4960	4920
100				10	10	8.7	8.7	8.5	22.0	21.5	21.5	8.1	7.7	7.8	9320	9120
Technician Initials				~	~	JM	~	~	JM	~	~	JM	~	~	JM	~

Sample Description Clear, colourless
WQ Instruments Used: Temp. Calibrated Hg Thermometer pH II-A-080501 DO II-A-011201 Cond. II-A-990501
Comments

Test Set Up By JRY Data Verified By [signature] Date Verified Nov. 16/04

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: Azimuth (Polaris) | EVS Analysts: AMD, RETH
EVS Project No.: 09-0302-54 | Test Type: 96-h LC50
EVS Work Order No.: 0900382 | Test Initiation Date: August 27/04 @ 1145

SAMPLE
Identification: G-Creek
Amount Received: 5 x 20L
Date Collected: Aug 24/04
Date Received: Aug 27/04
Other: —

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 15
pH: 7.4
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 46
Hardness (mg/L as $CaCO_3$): 16
Alkalinity (mg/L as $CaCO_3$): 10
Other: —

TEST SPECIES INFORMATION
Source: Sun Valley
Collection Date/Batch: 072804
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: Aug 31/04
Fork Length (mm): 0.40 ± 0.02 (0.38–0.44)
Wet Weight (g): 0.45 ± 0.10 (0.31–0.61)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: Aug 27/04
Duration of Acclimation (days): 30
96-h LC50 (and 95% CL): 38 (33 and 44) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29 ± 13 mg/L SDS CV: 22%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.1 – 10.1
Temperature Range (°C): 15 each
pH Range: 7.2 – 7.89
Conductivity Range (µS/cm): 46 – 7533
Aeration Provided? (give rate): 6.5 ± 1 mL/min
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10 / 12L
Loading Density (g/L): 0.38
Acclimation Before Testing (days): 30
Mortality In Previous Week of Acclimation (%): 0
Other: —

TEST RESULTS The 96-h LC50 was estimated to be >100% (v/v)

Data Verified By: Original | Date Verified: Nov 16/04

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	15		15
pH	7.7		7.7
DO (mg/L)	9.9		10.1
Cond. (µS/cm)	7416		7416

1. Document pH adjustment procedure (if used) under "Comments".

Total Pre-Aeration Time 30 minutes

Client Azimuth (Polaris)
EVS Project No. 09-0302-S4
EVS Work Order No. 0400382
Trout Batch No. and 7-d Acclimation Mortality 072804 / 0%
No. Fish/Volume 10/12L
Sample ID G-Creek
Date/Time Collected August 24/04 @ 1500
Test Initiation Date/Time August 27/04 @ 1145

Concentration % (V/V)	Number of Survivors (1 to 96 hours)							Dissolved Oxygen (mg/L)					Temperature (°C)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Control				10	10	10	10	10.1	9.9	9.8	10.0	9.8	15	15	15	15	15	7.4	7.4	7.5	7.2	7.4	46	58
6.25				10	10	10	10	10.1	9.7	9.8	10.0	9.9	15	15	15	15	15	7.5	7.5	7.9	7.4	7.9	556	601
12.5				10	10	10	10	10.1	9.9	9.8	9.3	9.6	15	15	16	15	15	7.6	7.5	7.8	7.5	7.6	1030	1054
25				10	10	10	10	10.1	9.8	9.9	9.1	9.5	15	15	16	15	15	7.6	7.7	7.8	7.6	7.6	1825	1881
50				10	10	10	10	10.1	9.8	9.9	9.5	9.3	15	16	16	15	15	7.7	7.8	7.7	7.6	7.7	3950	3983
100				10	10	10	10	10.1	9.8	9.9	9.6	9.5	15	15	16	15	15	7.7	7.8	7.9	7.8	7.8	7416	7533
Technician Initials						RKH	RKH	RKH			RKH	RKH	RKH			RKH	RKH	RKH			RKH	RKH	RKH	RKH

WQ Instruments Used: Temperature Calibrated Hg Thermo pH II-A-020601 DO II-A-3 Conductivity II-A-030306
Sample Description Test is clear with slight cloudy
Comments

Test Set Up By RKH Data Verified By [signature] Date Verified Nov. 16/04

CHAIN-OF-CUSTODY/TEST REQUEST FORM

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

Client Name: Atlantic Consulting Ltd / Teck Cominco
Client Contact Name: Cheryl Mackenzie / Brian Dodd
Ship to: EVS Environmental Consultants
Address: 208-2002 West Broadway, Vancouver BC, V6K 2G8
Phone: (604) 730-1220
Fax: (604) 739-9070
195 Pemberton Ave., North Vancouver, BC, V7P 2R4
Shipping Date: Aug. 31, 2004
Sampled By: Brandy Hooker / Mackenzie
Attn: Edmund Chavis

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested: Saturated paste EC & pH	Test(s) Requested: Sulphate, Mercury (CS-Hg) EC & pH	Test(s) Requested: Total Recoverable Hg	Test(s) Requested: Extractable Hg for Bioaccumulation			3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)	Receipt Sample Temp. (°C)	4 Condition/Integrity
For composite sample record date & time starting and ending																
31/Aug/04	15:00	G-Creek-092104	C		G	5x20L	C	✓	✓	✓	✓			Preserved with 0.2% HNO3		

PO/Reference No.: 11-05-03
Project Title: Blairmore
Results Needed By:

Comments/Instructions:

EVS Receipt Check List
EVS Project #: 04-1108-01
EVS Workorder #: 04082138 (1385 1384 1383)
Sample Storage Location: 4°C ☒ Chemical ☐ Other: RET / MMER (Gen Tech)
Supporting documentation/other information attached if applicable:

1. Signatures & dates correct? Y N
2. Chain-of-custody fully completed? Y N
3. Containers arrived in good condition (unbroken)? Y N
4. Container labels completed (i.e. dates, ID's)? Y N
5. Container labels agreed with custody papers? Y N
6. Sample receipt temperature within acceptable range? Y N
7a. Sediment testing going to be initiated within 14 days? Y N
7b. If no, are samples under Nitrogen? If not, why? Y N
8. Chain-of-custody generated upon receipt? ☒
9. Sample containers originate from EVS? ☒

A) Released By: [illegible] Date: Aug 31/04
Company: Atlantic Time: 4:00pm
Courier name: Bob at Intek
Shipping containers secured by: (Tape) Straps Lock Other _____ (circle one)
Custody seals used? Yes No METAL STRIPS

B) Received by: DXF Date: 2 SEP 04
Company: EVS Time: 0945
Shipping containers received secure? (Yes) No
Custody seals intact? (Yes) No N/A

C) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify)
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

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Revision Date: Sept. 25, 2000

APPENDIX E

Sublethal Toxicity Testing Laboratory Reports

Azimuth Consulting Group

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

July 10, 2004

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

July 10, 2004

LABORATORY REPORT

Prepared for

Azimuth Consulting Group
218-2902 W. Broadway
Vancouver, BC
V6K 2G8

Prepared by

EVS Environment Consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

09-0302-54

September 2004

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APPENDIX B Chain-of-Custody Form

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Table 1: 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods **3**

Table 2: Summary of results for the 7-d Topsmelt (*Atherinops affinis)* surival and growth toxicity test. **5**

ACKNOWLEDGEMENTS

Toxicity testing was conducted by Andy Diewald, Anja Fouche, Keven Goodearle, Ann-Marie Norris and Jenny Shao. Statistical analyses were perfomed by Jenny Shao The report was written by Kathryn Sentance and reviewed by Edmund Canaria. Quality Assurance/Quality Control (QA/QC) review was conducted by Julianna Kalokai.

1. INTRODUCTION

EVS Environment Consultants conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as G Creek, was collected from the Polaris Mine Site on July 07, 2004 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on July 10, 2004 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test. The 7-d topsmelt toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test. The raw data and statistical analyses are provided in Appendix A and the chain-of-custody form is provided in Appendix B.

The sample was also intended for toxicity evaluation using the echinoderm (*Dendraster excentricus*) fertilization toxicity test as part of the EEM program requirements. The test was not initiated successfully due to inability of the sand dollars to spawn.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d toxicity test and reference toxicant test using topsmelt (A. *affinis*) was conducted in accordance with EVS Environment Consultants Standard Operating Procedures (SOP) 1100-4 (EVS, 2002) with modifications based on U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994). The Power Standards were calculated as outlined by the Washington Department of Ecology (WDOE, 2001).

2.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and record-keeping, and use of standard operating procedures (SOPs). To ensure the highest quality of data and reporting, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	11d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.45µm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.5, 9.1, 18.2, 36.3, 72.6% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The highest concentration tested was 72.6% due to salinity adjustment. The test results are summarized in Table 2 and the raw statistical analyses are provided in Appendix A.

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival or growth in all tested concentrations relative to the pooled controls ($p \leq 0.05$). The mean survival in both the negative and brine controls was 96%.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

An attempt was made to initiate the echinoderm (*Dendraster excentricus*) fertilization toxicity test as part of the sample evaluation requirements. The sand dollars purchased from Westwind Sealab Supplies, did not spawn, and consequently, the test was not initiated. The inability of the sand dollars to spawn may have resulted from various reasons such as handling of organisms during transport, seasonal conditions, holding and culturing conditions and poor quality of organisms.

Table 2. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% v/v)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
D-Control	96.0 ± 8.9	0.93 ± 0.18
Brine Control	96.0 ± 8.9	1.08 ± 0.17
Pooled Controls	96.0 ± 8.4	1.00 ± 0.18
4.5	100 ± 0.0	1.00 ± 0.08
9.1	100 ± 0.0	1.04 ± 0.09
18.2	100 ± 0.0	0.96 ± 0.09
36.3	96.0 ± 8.9	1.10 ± 0.15
72.6	92.0 ± 11.0	0.99 ± 0.22
TEST ENDPOINT	**SURVIVAL (% v/v)**	**GROWTH (% v/v)**
NOEC	72.6	72.6
LOEC	>72.6	>72.6
LC50	>72.6	na
IC50	na	>72.6
IC25	na	>72.6

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; na – not applicable.

4. REFERENCES

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US EPA (U.S. Environmental Protection Agency). 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 3rd edition. US Environmental Protection Agency, Office of Water (4303T). US Environmental Protection Agency, Washington, DC. EPA/821/R-02/014. 464 pp.

US EPA. 1995. Short term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 2nd edition. US Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Washington, DC. EPA/600/R-95/136. 563 pp.

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APPENDIX A

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client ** Azimuth (Polaris Mine)
EVS Project No. 09-0302-54
EVS Work Order No. 0400303

EVS Analysts KMG. AKN AWD. AXF, JXS
Test Initiation Date 10-Jul-04

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	G-CREEK -070704	-	-
Amount Received		-	-
Date Collected		-	-
Date Received	10-Jul-04	-	-
Temperature (°C)	19.5 ① → 19.0	-	-
pH	8.1 ① → 8.0	-	-
DO (mg/L)	9.3 ① → 7.9	-	-
Conductivity (µmhos/cm)	11600	-	-
Salinity (ppt)	7 ① → 29	-	-
Ammonia (mg/L N)	-	-	-
Chlorine (mg/L Cl)	-	-	-
Other	-	-	-

DILUTION/CONTROL WATER (initial water quality)
Water Type UV STERILIZED, FILTERED SEA H2O
Temperature (°C) 20.0
pH 8.0
Dissolved Oxygen (mg/L) 7.6
Salinity 28

TEST SPECIES INFORMATION
Source AQUATIC BIO SYSTEMS (ABS)
Date Received 08-Jul-04
Age (on Day 0) 11d
Reference Toxicant Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date 10-Jul-04
7-d survival LC50 ~~143~~ 161 ~~148-203~~ 203 mg/L Cu (139-188)
7-d growth IC50 147 mg/L Cu (119-169)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 134 mg/L Cu ± ~~28.5~~ 28.6 CV = 21%
7-d growth IC50 135 mg/L Cu ± ~~24~~ 25 CV = 19%

① SAL. ADJ. TO 30 ± 2 ppt.

TEST CONDITIONS
Temperature Range (°C) 19.0 - 21.0
pH Range 7.8 - 8.3
Dissolved Oxygen Range (mg/L) 6.1 - 7.9
Salinity (ppt) 28 - 31
Photoperiod (L:D h) 16:8
Aeration Provided? No
Other —

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	% (v/v)	72.6	> 72.6	> 72.6		
Growth		72.6	> 72.6		> 72.6	> 72.6

Other -

Data Verified By Galyn A
Date Verified August 18/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Pebble Mines) | Sample ID: G-Creek [illegible] 7 of 7

EVS Project No.: 09-0302-84 | Test Initiation Date/Time: 10-Jul-04 / 1730h

EVS Work Order No.: 04CC303 | Source/Date Received: ABS / 08-Jul-04

Concentration (% v/v)	Temperature (°C)													
	0	1		new 2	old	3		new 4	old	new 5	old	new 6	old	7
Neg. Ctl	20.0	20.0	19.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
Brine Ctl	20.0	20.0	19.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
4.5	20.0	20.0	19.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
9.1	20.0	20.0	19.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
18.2	20.0	20.0	19.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
36.3	19.5	20.0	19.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
72.6	19.0	20.0	19.5	20.0	20.5	20.5	21.0	20.0	21.0	20.0	20.5	20.0	21.0	20.5
Tech. Initials	KWL	AF	AF				JAS	JAS	JAS			JAS	JAS	

Concentration (% v/v)	pH													
	0	1		2		3		New 4		5		6		7
Neg. Ctl	8.0	8.0	7.9	7.9	7.8	7.9	7.8	8.0	7.8	8.0	7.9	8.0	7.9	7.9
Brine Ctl	8.1	8.0	7.9	7.9	7.8	7.9	7.8	8.0	7.8	8.0	7.9	8.0	7.9	7.9
4.5	8.0	8.0	7.9	7.9	7.8	7.9	7.8	8.0	7.9	~~7.6~~ 8.1	7.9	8.0	7.9	7.9
9.1	8.0	8.0	7.9	7.9	7.8	7.9	7.8	8.0	7.9	8.1	8.0	8.0	8.0	7.9
18.2	8.0	8.0	7.9	7.9	7.8	7.9	7.9	8.1	8.0	8.2	8.1	8.1	8.0	7.9
36.3	8.0	8.0	7.9	7.9	7.9	7.9	7.9	8.1	8.0	8.3	8.1	8.1	8.1	8.0
72.6	8.0	8.0	7.9	8.0	7.9	8.1	8.0	8.2	8.1	8.3	8.2	8.2	8.1	8.1
Tech. Initials	KWL	AF	AF		AXF		JAS	JAS	JAS			JAS	JAS	

WQ Instruments Used: Temp. Cal. Hg Therm. pH II-A-030301

Comments

Test Set Up By KWL Data Verified By [signature] Date Verified August 17/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris Mine) | Sample ID: G-Creek - 070704

EVS Project No.: 04-0302.54 | Test Initiation Date/Time: 10-Jul-04 / 1730h

EVS Work Order No.: 0406303 | Source/Date Received: ABS / 08-Jul-04

Concentration (% v/v)	Salinity (ppt)							
	0	1	2	3	4	5	6	7
Neg. Ctl	28	30	28	28	28	28	28	29
Brine Ctl	29	30	30	29	29	30	30	30
4.5	28	30	28	28	28	28	28	29
9.1	28	31	28	28	28	28	28	29
18.2	28	30	28	28	28	28	28	29
36.3	28	31	28	28	28	28	28	29
72.6	29	30	28	28	28	28	28	29
Tech. Initials	KMB	AL	~	~	JLJ	~	JLJ	~

Concentration (% v/v)	Dissolved Oxygen (mg/L)													
	0	1		2		3		New 4		5		6		7
Neg. Ctl	7.6	7.6	7.4	7.5	6.1	7.4	6.2	7.6	6.6	7.5	6.9	7.6	6.6	6.7
Brine Ctl	7.6	7.6	7.5	7.5	6.2	7.5	6.2	7.5	6.6	7.5	6.8	7.5	6.6	6.6
4.5	7.4	7.6	7.3	7.4	6.1	7.4	6.2	7.6	6.4	7.4	6.8	7.6	6.7	6.8
9.1	7.4	7.6	7.3	7.4	6.1	7.4	6.2	7.6	6.5	7.4	6.8	7.6	6.6	6.7
18.2	7.6	7.4	7.3	7.5	6.3	7.4	6.2	7.6	6.6	7.4	6.7	7.6	6.6	6.7
36.3	7.6	7.6	7.4	7.5	6.3	7.5	6.2	7.6	6.6	7.4	6.8	7.6	6.5	6.7
72.6	7.9	7.6	7.2	7.6	6.4	7.6	6.2	7.6	6.5	7.4	6.8	7.6	6.6	6.7
Tech. Initials	KMB	~	~	AK	AXF	~	JLJ	JLJ	JLJ	~	~	JLJ	JLJ	~

WQ Instruments Used: Salinity II-A-030306 DO II-A-3 / II-A-011202

Comments

Test Set Up By: KMB Data Verified By: [signature] Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Mine)
EVS Project No.: 09-0302-54
EVS Work Order No.: 04 08303

Sample ID: ~~EE~~ G-Creek-070704
Test Species/Batch: A. affinis / 6-29-04
Test Initiation Date/Time: 10-Jul-04 / 1730h
No. of Organisms/Volume: 5 / 200 mL

Concentration (% v/v)	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
Neg Ctl	A	T1	5	5	5	5	5	5	5	
	B	T2	5	5	5	5	5	5	5	
	C	T3	5	5	5	5	4	4	4	
	D	T4	5	5	5	5	5	5	5	
	E	T5	5	5	5	5	5	5	5	
Reinf Ctl.	A	T6	5	5	5	5	5	5	5	
	B	T7	5	5	5	5	5	5	~~5~~ 4	
	C	T8	5	5	5	5	5	5	5	
	D	T9	5	5	5	5	5	5	5	
	E	T10	5	5	5	5	5	5	5	
4.5	A	T11	5	5	5	5	5	5	5	
	B	T12	5	5	5	5	5	5	5	
	C	T13	5	5	5	5	5	5	5	
	D	T14	5	5	5	5	5	5	5	
	E	T15	5	5	5	5	5	5	5	
9.1	A	T16	5	5	5	5	5	5	5	
	B	T17	5	5	5	5	5	5	5	
	C	T18	5	5	5	5	5	5	5	
	D	T19	5	5	5	5	5	5	5	
	E	T20	5	5	5	5	5	5	5	
Technician Initials		JW	AH	AH	JW	JW	JW	JW	JW	

Sample Description: LIGHT GREY TRANSPARENT, NO ODOUR.
Data Verified By: [signature]
Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-0302-54
EVS Work Order No.: 0400303

Sample ID: G. CREEK - 070704
Test Species/Batch: A. AFFINIS / 6.09.04
Test Initiation Date/Time: 10-JUL-04 / 1730h
No. of Organisms/Volume: 5 / 200mL

Concentration (% v/v)	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
18.2	A	T21	5	5	5	5	5	5	5	
	B	T22	5	5	5	5	5	5	5	
	C	T23	5	5	5	5	5	5	5	
	D	T24	5	5	5	5	5	5	5	
	E	T25	5	5	5	5	5	5	5	
36.3	A	T26	5	5	5	5	5	5	5	
	B	T27	5	5	5	5	5	5	5	
	C	T28	4	4	4	4	4	4	4	
	D	T29	5	5	5	5	5	5	5	
	E	T30	5	5	5	5	5	5	5	
72.6	A	T31	5	5	5	5	5	5	5	
	B	T32	5	5	5	5	5	5	5	
	C	T33	5	5	5	5	5	5	4	
	D	T34	5	5	5	5	5	5	5	
	E	T35	5	5	5	5	5	5	4	
	A									
	B									
	C									
	D									
	E									
Technician Initials		Tay		AH/m	JJ	JD	JM	JLS		

Sample Description: LIGHT GREY, TRANSPARENT, NO ODOUR.
Data Verified By: Quality
Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Mines)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP2111

Test Type: 7 d Survival and Growth
Test Species: Atherinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: G & L Creek - 070704

Sample ID 0% (S/U)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
Ctl	A	1	1265.92	1271.98	5	5		TM
	B	2	1267.67	1272.69	5	5		
	C	3	1264.20	1269.67	4	4		
	D	4	1265.68	1268.14	5	5		
	E	5	1265.14	1269.37	5	5		
Brine Ctl	A	6	1275.52	1281.17	5	5		TM
	B	7	1262.43	1266.70	4	4		
	C	8	1261.98	1268.48	5	5		
	D	9	1264.82	1270.38	5	5	confirmed: 1270.27 mg ✓	
	E	10	1262.05	1267.02	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Mines)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP2111

Test Type: 7 d Survival and Growth
Test Species: Atherinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: G L Creek - 070704

Sample ID % (J/J)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
4.5	A	T 11	1266.53	1271.28	5	5		JJ
	B	12	1271.92	1276.64	5	5		
	C	13	1270.40	1275.21	5	5		
	D	14	1276.78	1282.46	5	5		
	E	15	1248.70	1253.83	5	5		
9.1	A	T 16	1273.13	1278.39	5	5		JJ
	B	17	1259.26	1264.29	5	5		
	C	18	1270.13	1274.65	5	5		
	D	19	1258.37	1263.78	5	5		
	E	20	1256.17	1261.85	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Gal Jick

Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Mines)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP2111

Test Type: 7 d Survival and Growth
Test Species: Atherinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: G-L Creek - 070704

Sample ID % (S/J)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
18.2	A	21	1257.35	1262.90	5	5		JCS
	B	22	1273.94	1278.48	5	5	confirmed: 1278.26 ✓	
	C	23	1277.53	1282.20	5	5		
	D	24	1274.93	1279.50	5	5		
	E	25	1268.36	1272.94	5	5		
36.3	A	26	1269.83	1275.11	5	5	confirmed 1274.99 mg ✓	JCS
	B	27	1269.98	1276.47	5	5		
	C	28	1276.05	1280.68	4	4		
	D	29	1249.27	1254.33	5	5		
	E	30	1265.89	1271.96	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Gaigh

Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Mines)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP211

Test Type: 7 d Survival and Growth
Test Species: Atherinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: 6 Creek - 070704

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
72.6	A	T 31	1251.66	1256.44	5	5	confirmed: 1256.42 mg ✓	JG
	B	32	1263.20	1269.86	5	5		
	C	33	1278.57	1282.63	4	4		
	D	34	1281.29	1285.32	5	5		
	E	√ 35	1253.46	1258.69	4	4		
	A	T 6						
	B	7						
	C	8						
	D	9						
	E	√ 0						

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Galjak
Date Verified: August 17/04

Test: LF-Larval Fish Growth and Survival Test
Test ID: 0400303
Species: AA-Atherinops affinis
Protocol: EPAW 95-EPA West Coast
Sample ID: G-Creek-070704
Sample Type: EFF2-Industrial
Start Date: 7/10/2004 End Date: 7/17/2004
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	Neg Control	5							5	5	1271.98	1265.92
	2	2	Neg Control	5							5	5	1272.69	1267.67
	3	3	Neg Control	5							4	4	1269.67	1265.68
	4	4	Neg Control	5							5	5	1268.14	1264.2
	5	5	Neg Control	5							5	5	1269.37	1265.14
	6	1	Brine Control	5							5	5	1281.17	1275.52
	7	2	Brine Control	5							4	4	1266.7	1262.43
	8	3	Brine Control	5							5	5	1268.48	1261.98
	9	4	Brine Control	5							5	5	1270.38	1264.82
	10	5	Brine Control	5							5	5	1267.02	1262.05
	11	1	4.500	5							5	5	1271.28	1266.53
	12	2	4.500	5							5	5	1276.64	1271.92
	13	3	4.500	5							5	5	1275.21	1270.46
	14	4	4.500	5							5	5	1282.46	1276.78
	15	5	4.500	5							5	5	1253.83	1248.7
	16	1	9.100	5							5	5	1278.39	1273.13
	17	2	9.100	5							5	5	1264.29	1259.26
	18	3	9.100	5							5	5	1274.65	1270.13
	19	4	9.100	5							5	5	1263.78	1258.37
	20	5	9.100	5							5	5	1261.85	1256.17
	21	1	18.200	5							5	5	1262.9	1257.35
	22	2	18.200	5							5	5	1278.48	1273.94
	23	3	18.200	5							5	5	1282.2	1277.53
	24	4	18.200	5							5	5	1279.5	1274.93
	25	5	18.200	5							5	5	1272.94	1268.36
	26	1	36.300	5							5	5	1275.11	1269.83
	27	2	36.300	5							5	5	1276.47	1269.98
	28	3	36.300	5							4	4	1280.68	1276.05
	29	4	36.300	5							5	5	1254.33	1249.27
	30	5	36.300	5							5	5	1271.98	1265.87
	31	1	72.600	5							5	5	1256.44	1251.66
	32	2	72.600	5							5	5	1269.86	1263.2
	33	3	72.600	5							4	4	1282.63	1278.57
	34	4	72.600	5							5	5	1285.32	1281.29
	35	5	72.600	5							4	4	1258.69	1253.46

Comments: Azimuth(Polaris Mine)09-0302-54; 0400303

Reviewed by: August 18/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/10/2004	Test ID: 400303	Sample ID: G-Creek-070704
End Date:	7/17/2004	Lab ID: BCEVS-EVS Environment Cc	Sample Type: EFF2-Industrial
Sample Date:		Protocol: EPAW 95-EPA West Coast	Test Species: AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54; 0400303		

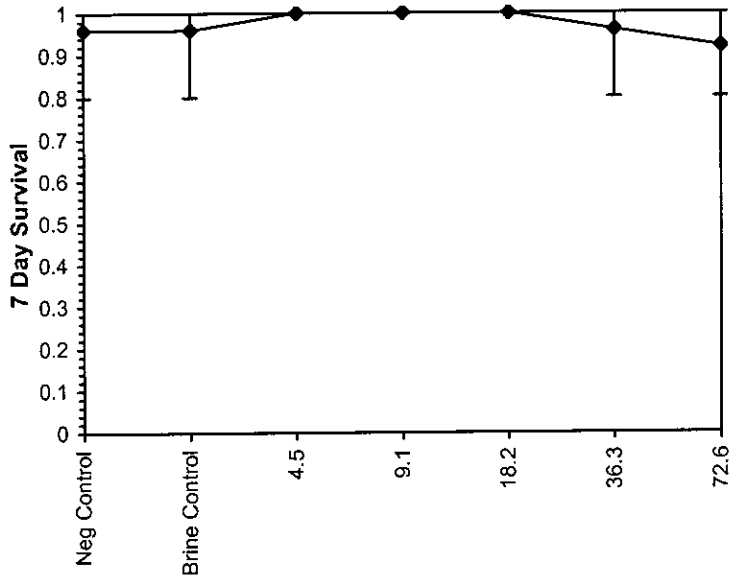
Conc-%	1	2	3	4	5
Neg Control	1.0000	1.0000	0.8000	1.0000	1.0000
Brine Control	1.0000	0.8000	1.0000	1.0000	1.0000
4.5	1.0000	1.0000	1.0000	1.0000	1.0000
9.1	1.0000	1.0000	1.0000	1.0000	1.0000
18.2	1.0000	1.0000	1.0000	1.0000	1.0000
36.3	1.0000	1.0000	0.8000	1.0000	1.0000
72.6	1.0000	1.0000	0.8000	1.0000	0.8000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Neg Control	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5		
Brine Control	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5		
4.5	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	16.00
9.1	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	16.00
18.2	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	16.00
36.3	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	27.50	16.00
72.6	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5	25.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.76012	0.9	-1.4778	1.97749
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	72.6	>72.6		1.37741

Dose-Response Plot



Statistical comparisons were aginst the Neg Control only

Reviewed by: August 18/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/10/2004	Test ID:	400303	Sample ID:	G-Creek-070704
End Date:	7/17/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54; 0400303				

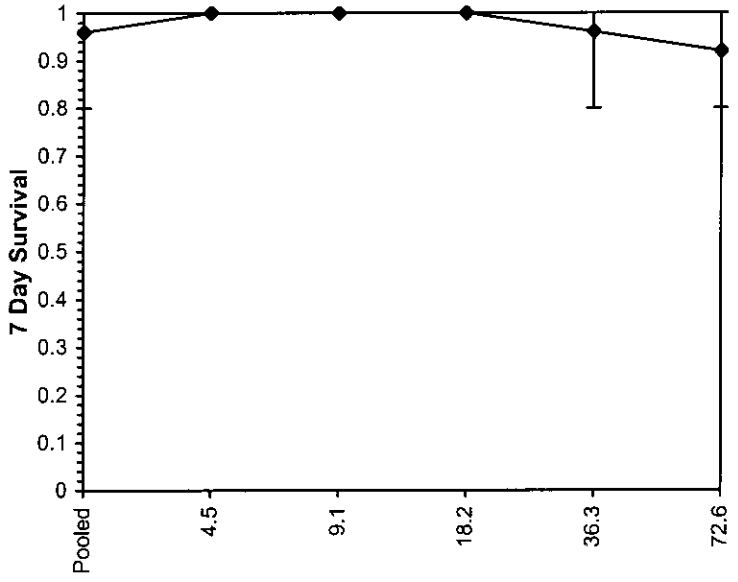
Conc-%	1	2	3	4	5
Neg Control	1.0000	1.0000	0.8000	1.0000	1.0000
Brine Control	1.0000	0.8000	1.0000	1.0000	1.0000
4.5	1.0000	1.0000	1.0000	1.0000	1.0000
9.1	1.0000	1.0000	1.0000	1.0000	1.0000
18.2	1.0000	1.0000	1.0000	1.0000	1.0000
36.3	1.0000	1.0000	0.8000	1.0000	1.0000
72.6	1.0000	1.0000	0.8000	1.0000	0.8000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Pooled	0.9600	0.0843	1.2977	1.1071	1.3453	7.738	10		
4.5	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	45.00	21.00
9.1	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	45.00	21.00
18.2	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	45.00	21.00
36.3	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	40.00	21.00
72.6	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5	35.00	21.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.74527	0.91	-1.5211	1.67424
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	72.6	>72.6		1.37741

Dose-Response Plot



Statistical comparisons were against the Pooled Controls

Reviewed by: August 18/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/10/2004	Test ID:	400303	Sample ID:	G-Creek-070704
End Date:	7/17/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54; 0400303				

Conc-%	1	2	3	4	5
Neg Control	1.2120	1.0040	0.7980	0.7880	0.8460
Brine Control	1.1300	0.8540	1.3000	1.1120	0.9940
4.5	0.9500	0.9440	0.9500	1.1360	1.0260
9.1	1.0520	1.0060	0.9040	1.0820	1.1360
18.2	1.1100	0.9080	0.9340	0.9140	0.9160
36.3	1.0560	1.2980	0.9260	1.0120	1.2220
72.6	0.9560	1.3320	0.8120	0.8060	1.0460

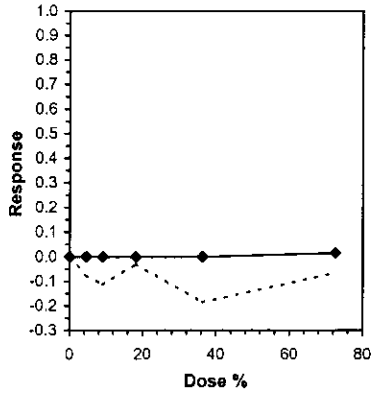
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Neg Control	0.9296	0.1800	0.9296	0.7880	1.2120	19.366	5				1.0052	1.0000
Brine Control	1.0780	0.1661	1.0780	0.8540	1.3000	15.410	5					
4.5	1.0012	0.0826	1.0012	0.9440	1.1360	8.252	5	-0.786	2.360	0.2151	1.0052	1.0000
9.1	1.0360	0.0876	1.0360	0.9040	1.1360	8.456	5	-1.168	2.360	0.2151	1.0052	1.0000
18.2	0.9564	0.0864	0.9564	0.9080	1.1100	9.035	5	-0.294	2.360	0.2151	1.0052	1.0000
36.3	1.1028	0.1533	1.1028	0.9260	1.2980	13.901	5	-1.901	2.360	0.2151	1.0052	1.0000
72.6	0.9904	0.2161	0.9904	0.8060	1.3320	21.819	5	-0.667	2.360	0.2151	0.9904	0.9853

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93465	0.9	0.85573	0.53805
Bartlett's Test indicates equal variances (p = 0.27)	6.38263	15.0863		
The control means are not significantly different (p = 0.21)	1.35465	2.30601		

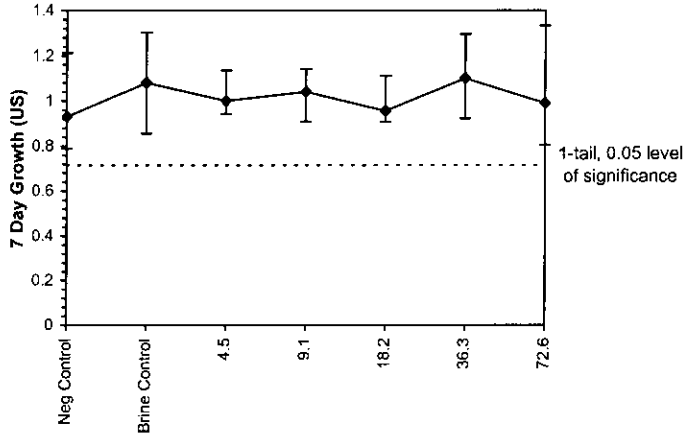
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	72.6	>72.6		1.37741	0.21507	0.23136	0.01877	0.02076	0.49467	5, 24

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>72.6			
IC10	>72.6			
IC15	>72.6			
IC20	>72.6			
IC25	>72.6			
IC40	>72.6			
IC50	>72.6		%(v/v)	



Dose-Response Plot



Statistical comparisons were against the Neg Control only

Reviewed by: August 18/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/10/2004	Test ID:	400303	Sample ID:	G-Creek-070704
End Date:	7/17/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54; 0400303				

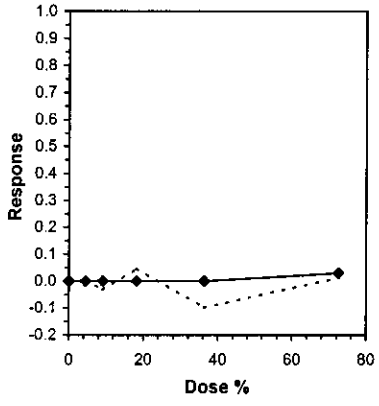
Conc-%	1	2	3	4	5
Neg Control	1.2120	1.0040	0.7980	0.7880	0.8460
Brine Control	1.1300	0.8540	1.3000	1.1120	0.9940
4.5	0.9500	0.9440	0.9500	1.1360	1.0260
9.1	1.0520	1.0060	0.9040	1.0820	1.1360
18.2	1.1100	0.9080	0.9340	0.9140	0.9160
36.3	1.0560	1.2980	0.9260	1.0120	1.2220
72.6	0.9560	1.3320	0.8120	0.8060	1.0460

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	1.0038	0.1811	1.0038	0.7880	1.3000	18.038	10				1.0200	1.0000
4.5	1.0012	0.0826	1.0012	0.9440	1.1360	8.252	5	0.031	2.462	0.2040	1.0200	1.0000
9.1	1.0360	0.0876	1.0360	0.9040	1.1360	8.456	5	-0.389	2.462	0.2040	1.0200	1.0000
18.2	0.9564	0.0864	0.9564	0.9080	1.1100	9.035	5	0.572	2.462	0.2040	1.0200	1.0000
36.3	1.1028	0.1533	1.1028	0.9260	1.2980	13.901	5	-1.195	2.462	0.2040	1.0200	1.0000
72.6	0.9904	0.2161	0.9904	0.8060	1.3320	21.819	5	0.162	2.462	0.2040	0.9904	0.9709

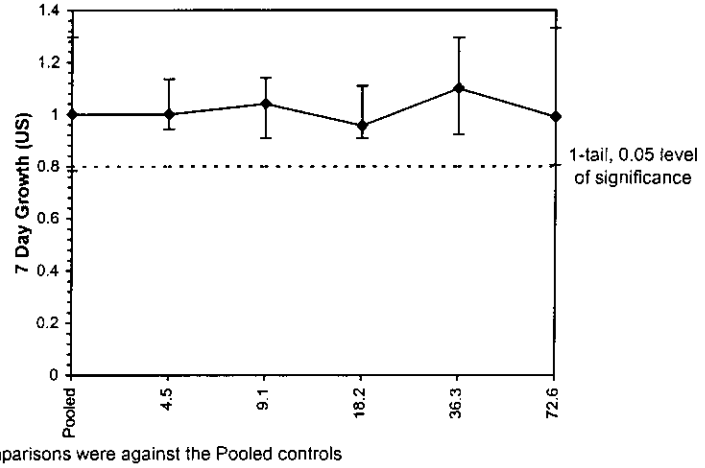
Auxiliary Tests				Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)				0.95473		0.91		0.53946	-0.0716
Bartlett's Test indicates equal variances (p = 0.23)				6.8891		15.0863			
The control means are not significantly different (p = 0.21)				1.35465		2.30601			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Bonferroni t Test	72.6	>72.6		1.37741	0.20401	0.20324	0.01261	0.02289	0.73615	5, 29

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>72.6			
IC10	>72.6			
IC15	>72.6			
IC20	>72.6			
IC25	>72.6			
IC40	>72.6			
IC50	>72.6		%(v/v)	



Dose-Response Plot



Statistical comparisons were against the Pooled controls

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-0302-54
EVS Work Order No.: 0400303

EVS Analysts: KMG, AKN, AWD, AVF, JXS
Test Initiation Date: 10-Jun-04

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	Cu Reftox (04-Cu-001)	–	–
Amount ~~Received~~ Refreshed	1 x 1L	–	–
Date ~~Collected~~ Prepared	15-MAR-04	–	–
Date Received	–	–	–
Temperature (°C)	–	–	–
pH	–	–	–
DO (mg/L)	–	–	–
Conductivity (µmhos/cm)	–	–	–
Salinity (ppt)	–	–	–
Ammonia (mg/L N)	–	–	–
Chlorine (mg/L Cl)	–	–	–
Other	–	–	–

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV Sterilized, Filtered Sea H2O
Temperature (°C): 20.0
pH: 8.0
Dissolved Oxygen (mg/L): 7.6
Salinity: 28

TEST SPECIES INFORMATION

Source: Aquatic BioSystems (ABS)
Date Received: 08-Jun-04
Age (on Day 0): 11d
Reference Toxicant: Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date: 15-Jul-04
7-d survival LC50: 161 mg/L Cu ~~(145-203)~~ (139-188)
7-d growth IC50: 147 mg/L Cu (119-169)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50: 137 mg/L Cu ± 23.50 CV = 21%
7-d growth IC50: 135 mg/L Cu ± 26.51 CV = 19%

TEST CONDITIONS

Temperature Range (°C): 19.5 - 20.5
pH Range: 7.8 - 8.0
Dissolved Oxygen Range (mg/L): 6.4 - 7.6
Salinity (ppt): 23-33
Photoperiod (L:D h): 16:8
Aeration Provided?: No
Other: –

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	mg/L Cu	100	180	161 (139-188)		
Growth		100	180		147 (119-169)	101 (63-133)

Other: –

Data Verified By: Qualified
Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris Mine) | Sample ID: Cu Reftox
EVS Project No.: 09-0302-54 | Test Initiation Date/Time: 10-Jul-04 / 1715h
EVS Work Order No.: 0400303 | Source/Date Received: ABS / 08-Jul-04

Concentration (µg/L Cu)	Temperature (°C)													
	0	1		New 2 old		New 3 old		New 4 old		5		6		7
CTL	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0
32	20.0	20.0	19.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0
56	20.0	20.0	19.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0
100	20.0	20.0	19.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0
180	20.0	20.0	19.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0
320	20.0	20.0	19.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.0	20.0
Tech. Initials	KMB	AKW	AF	~	JKJ	~	~	JKJ	JKJ	~	~	JKJ	JKJ	~

Concentration (µg/L Cu)	pH													
	0	1		New 2 old		New 3 old		New 4		5		6		7
CTL	8.0	8.0	7.9	7.9	7.8	7.9	7.8	7.9	7.9	8.0	7.9	8.0	7.9	7.9
32	8.0	8.0	7.9	7.9	7.8	7.9	7.8	7.9	7.9	8.0	7.9	8.0	7.9	7.9
56	8.0	8.0	7.8	7.9	7.8	7.9	7.9	7.9	7.9	8.0	7.9	8.0	7.9	7.9
100	8.0	8.0	7.8	7.9	7.8	7.9	7.9	7.9	7.9	8.0	7.9	8.0	7.9	7.9
180	8.0	8.0	7.8	7.9	7.8	7.9	7.9	7.9	7.9	8.0	7.9	8.0	7.9	7.9
320	8.0	8.0	7.8	7.9	7.8	7.9	7.9	7.9	7.9	8.0	8.0	8.0	7.9	7.9
Tech. Initials	KMB	AKW	AF	~	AXF/~	~	~	JKJ	JKJ	~	~	JKJ	JKJ	~

WQ Instruments Used: Temp. Cal. Hg Therm. pH I-A-0303c1
Comments

Test Set Up By: KMB | Data Verified By: QAC | Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris Mine) | Sample ID: Cu Reftox
EVS Project No.: 09-0302-54 | Test Initiation Date/Time: 10-Jul-04 / 1715h
EVS Work Order No.: 0400303 | Source/Date Received: ABS / 08-Jul-04

Concentration (µg/L Cu)	Salinity (ppt)							
	0	1	2	3	4	5	6	7
CTL	28	30	28	28	28	28	28	29
32	28	30	28	28	28	28	28	29
56	28	30	28	28	28	28	28	29
100	28	30	28	28	28	28	28	29
180	28	30	28	28	28	28	28	29
320	28	30	28	28	28	28	28	29
Tech. Initials	KMC	AW	AW	AW	JCS	AW	JCS	AW

Concentration (µg/L Cu)	Dissolved Oxygen (mg/L)													
	0	1		2		3		New 4		5		6		7
CTL	7.6	7.6	7.5	7.5	5.4 AXE	7.4	6.4	7.6	6.6	7.5	7.0	7.6	6.6	7.0
32	7.6	7.6	7.5	7.5	6.4	7.4	6.6	7.6	6.6	7.5	7.0	7.6	6.8	6.9
56	7.6	7.6	7.4	7.5	6.7	7.4	6.5	7.6	6.4	7.5	7.0	7.6	6.6	6.9
100	7.6	7.6	7.4	7.5	6.6	7.4	6.6	7.6	6.6	7.5	7.0	7.6	6.7	6.9
180	7.6	7.6	7.4	7.5	6.8	7.4	6.4	7.6	6.6	7.5	7.0	7.6	6.7	6.7
320	7.6	7.6	7.0	7.5	6.9	7.4	6.7	7.6	6.6	7.5	6.9	7.6	6.7	6.6
Tech. Initials	KMC	AW	AW	AW	AXE/AW	AW	JCS	JCS	JCS	AW	AW	JCS	JCS	AW

WQ Instruments Used: Salinity II-A-030306 DO II-A-3 / II-A-011202

Comments

Test Set Up By: KMC Data Verified By: [signature] Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Nine)
EVS Project No.: 09-0302-54
EVS Work Order No.: 04CC303

Sample ID: Cu Reftox
Test Species/Batch: A. affinis / 6.29.04
Test Initiation Date/Time: 10-Jul-04 / 1715h
No. of Organisms/Volume: 5 / 200mL

Concentration (mg/L Cu)	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
CTL	A	T36	5	5	5	5	5	5	5	
	B	T37	5	5	5	5	5	5	5	
	C	T38	5	5	5	5	5	5	5	
	D	T39	5	5	5	5	5	5	5	
	E	T40	5	5	5	5	5	4	4	
32	A	T41	5	5	5	5	5	5	5	
	B	T42	5	5	5	5	5	5	5	
	C	T43	5	5	5	5	5	5	5	
	D	T44	5	5	5	5	5	5	5	
	E	T45	5	5	5	5	5	5	5	
56	A	T46	5	5	5	5	5	5	5	
	B	T47	5	5	5	5	5	5	5	
	C	T48	5	5	5	5	5	5	5	
	D	T49	5	5	5	5	5	5	5	
	E	T50	5	5	5	5	5	5	5	
100	A	T51	5	5	5	4	4	~~3~~	~~3~~	
	B	T52	5	5	5	5	5	5	5	
	C	T53	5	5	5	5	5	5	5	
	D	T54	5	5	4	4	4	4	~~4~~	
	E	T55	5	5	5	5	5	5	5	
Technician Initials		TW	AW	AW		TW	TW	TW		

Sample Description: CLEAR, COLORLESS, ODORLESS.
Data Verified By: Qualified
Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Mine) | Sample ID: Cu Reflex
EVS Project No.: C9-0302-54 | Test Species/Batch: A. affinis / 6.29.04
EVS Work Order No.: 04CC303 | Test Initiation Date/Time: 10-Jul-04 / 1715h
No. of Organisms/Volume: 5 / 200mL

Concentration (µg/L Cu)	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
180	A	T56	5	5	4	4	3	3	3	
	B	T57	5	3	1	1	1	1	1	
	C	T58	5	4	2	2	2	2	2	
	D	T59	5	3	2	1	1	1	1	
	E	T60	4	3	3	2	2	2	2	
320	A	T61	1	0	—	—	—	—	—	
	B	T62	3	3	3	2	2	2	2	
	C	T63	2	2	1	0	—	—	—	
	D	T64	1	1	0	—	—	—	—	
	E	T65	3	3	1	0	—	—	—	
	A									
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									
Technician Initials		JZS	AHW	AHW	N	JZS	JZS	JZS	N	

Sample Description: CLEAR, COLOURLESS, ODOURLESS.
Data Verified By: Qualified | Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Mines)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP2111

Test Type: 7 d Survival and Growth
Test Species: Arctinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: Cu Reftox

Sample ID 49/L Cu	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
320	A	T61	1255.61	—	0	0		TM
↓	B	62	1256.09	1257.79	2	2		↓
	C	63	1268.85	—	0	0		
	D	64	1252.87	—	0	0		
↓	E	↓65	1270.02	—	0	0		↓
180	A	T56	1252.98	1255.06	3	3		TM
↓	B	57	1247.43	1248.02	1	1		↓
	C	58	1270.37	1272.49	2	2	confirmed 1272.50 mg ✓	
	D	59	1280.94	1281.59	1	1		
↓	E	↓60	1280.02	1282.095	2	2		↓

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Qualified

Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Mines)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP2111)

Test Type: 7 d Survival and Growth
Test Species: Atherinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: Cu Reftox

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
49/L Cu								
100	A	T51	1272.54	1275.53	3	3		JZS
	B	52	1242.48	1247.54	5	5		
	C	53	1265.30	1269.62	5	5		
	D	54	1240.38	1243.48	4	4		
	E	55	1264.67	1269.25	5	5		
56	A	T46	1286.39	1291.02	5	5	confirm 1291.05 mg ✓	JZS
	B	47	1271.46	1276.05	5	5		
	C	48	1238.91	1243.78	5	5		
	D	49	1262.66	1267.58	5	5		
	E	50	1256.18	1261.80	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Qualified

Date Verified: August 17/04

EVS ENVIRONMENT CONSULTANTS
LARVAL FISH TOXICITY TESTS – DRY WEIGHT DATA

Client: Azimuth (Polaris Minerals)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400303
Balance Type/Serial Number: Sartorius BP2111)

Test Type: 7-d Survival and Growth
Test Species: Atherinops affinis (Topsmelt)
Start Date (Day 0): July 10-04
Sample ID: Cu Reftox

Sample ID 49/L Cu	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
32	A	T41	1280.70	1283.71	5	5		JCS
	B	42	1256.85	1261.03	5	5		
	C	43	1272.55	1276.95	5	5		
	D	44	1278.22	1284.04	5	5		
	E	45	1273.94	1280.06	5	5		
Ctl	A	T36	1272.84	1277.49	5	5		JCS
	B	37	1275.33	1280.65	5	5	confirmed: 1280.57 mg ✓	
	C	38	1269.27	1274.85	5	5		
	D	39	1236.88	1241.99	5	5		
	E	40	1264.45	1269.15	4	4		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Rachel

Date Verified: August 17/04

Test: LF-Larval Fish Growth and Survival Test
Species: AA-Atherinops affinis
Sample ID: REF-Ref Toxicant
Start Date: 7/10/2004 End Date: 7/17/2004

Test ID: RTAACu36
Protocol: EPAW 95-EPA West Coast
Sample Type: CU-Copper
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1277.49	1272.84
	2	2	D-Control	5							5	5	1280.65	1275.33
	3	3	D-Control	5							5	5	1274.85	1269.27
	4	4	D-Control	5							5	5	1241.99	1236.88
	5	5	D-Control	5							4	4	1269.15	1264.45
	6	1	32.000	5							5	5	1283.71	1280.7
	7	2	32.000	5							5	5	1261.03	1256.85
	8	3	32.000	5							5	5	1276.95	1272.95
	9	4	32.000	5							5	5	1284.04	1278.22
	10	5	32.000	5							5	5	1280.06	1273.94
	11	1	56.000	5							5	5	1291.02	1286.39
	12	2	56.000	5							5	5	1276.05	1271.46
	13	3	56.000	5							5	5	1243.78	1238.91
	14	4	56.000	5							5	5	1267.58	1262.66
	15	5	56.000	5							5	5	1261.8	1256.18
	16	1	100.000	5							3	3	1275.53	1272.54
	17	2	100.000	5							5	5	1247.54	1242.48
	18	3	100.000	5							5	5	1269.68	1265.3
	19	4	100.000	5							4	4	1243.48	1240.38
	20	5	100.000	5							5	5	1269.25	1264.67
	21	1	180.000	5							3	3	1255.06	1252.98
	22	2	180.000	5							1	1	1248.02	1247.43
	23	3	180.000	5							2	2	1272.49	1270.37
	24	4	180.000	5							1	1	1281.59	1280.94
	25	5	180.000	5							2	2	1282.05	1280.02
	26	1	320.000	5							0	0	0	1255.61
	27	2	320.000	5							2	2	1257.79	1256.09
	28	3	320.000	5							0	0	0	1268.85
	29	4	320.000	5							0	0	0	1252.87
	30	5	320.000	5							0	0	0	1270.02

Comments: 09-0302-54, 0400303

Reviewed by: August 17/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/10/2004	Test ID:	RTAACu36	Sample ID:	REF-Ref Toxicant
End Date:	7/17/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	09-0302-54, 0400303				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	0.8000
32	1.0000	1.0000	1.0000	1.0000	1.0000
56	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.6000	1.0000	1.0000	0.8000	1.0000
180	0.6000	0.2000	0.4000	0.2000	0.4000
320	0.0000	0.4000	0.0000	0.0000	0.0000

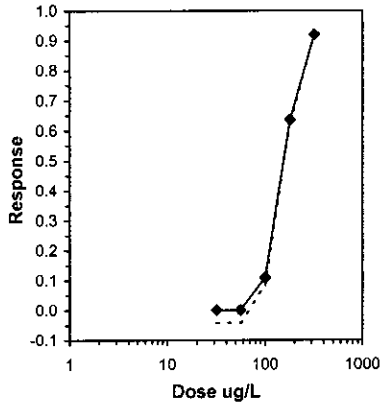
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5			1	25
32	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	16.00	0	25
56	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	16.00	0	25
100	0.8800	0.1789	1.2058	0.8861	1.3453	17.113	5	24.50	16.00	3	25
*180	0.3600	0.1673	0.6366	0.4636	0.8861	27.958	5	15.00	16.00	16	25
*320	0.0800	0.1789	0.3174	0.2255	0.6847	64.711	5	15.00	16.00	23	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93876	0.9	0.31435	1.7423
Equality of variance cannot be confirmed				

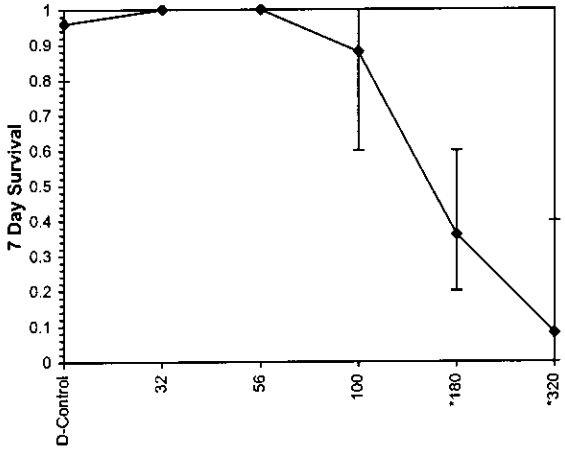
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	180	134.164	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%				
10.0%	161.11	138.26	187.73	
20.0%	158.05	132.14	189.04	
Auto-8.1%	161.46	138.66	188.00	ug/L Cu



Dose-Response Plot



Reviewed by Qalijk August 17/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/10/2004	Test ID:	RTAACu36	Sample ID:	REF-Ref Toxicant
End Date:	7/17/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	09-0302-54, 0400303				

Conc-ug/L	1	2	3	4	5
D-Control	0.9300	1.0640	1.1160	1.0220	0.9400
32	0.6020	0.8360	0.8000	1.1640	1.2240
56	0.9260	0.9180	0.9740	0.9840	1.1240
100	0.5980	1.0120	0.8760	0.6200	0.9160
180	0.4160	0.1180	0.4240	0.1300	0.4060
320	0.0000	0.3400	0.0000	0.0000	0.0000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.0144	0.0798	1.0144	0.9300	1.1160	7.871	5				1.0144	1.0000
32	0.9252	0.2619	0.9252	0.6020	1.2240	28.309	5	0.851	2.360	0.2474	0.9552	0.9416
56	0.9852	0.0828	0.9852	0.9180	1.1240	8.403	5	0.279	2.360	0.2474	0.9552	0.9416
100	0.8044	0.1853	0.8044	0.5980	1.0120	23.031	5	2.004	2.360	0.2474	0.8044	0.7930
*180	0.2988	0.1598	0.2988	0.1180	0.4240	53.465	5	6.827	2.360	0.2474	0.2988	0.2946
*320	0.0680	0.1521	0.0680	0.0000	0.3400	223.607	5	9.029	2.360	0.2474	0.0680	0.0670

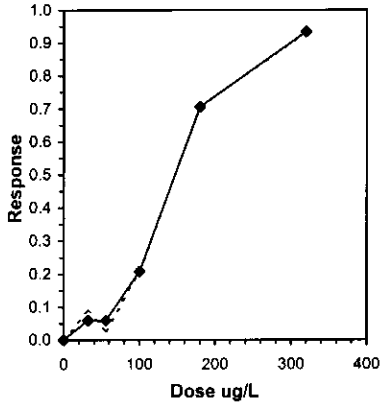
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97039	0.9	0.15928	-0.3767
Bartlett's Test indicates equal variances (p = 0.21)	7.13123	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	180	134.164		0.24736	0.24385	0.80038	0.02746	1.9E-09	5, 24

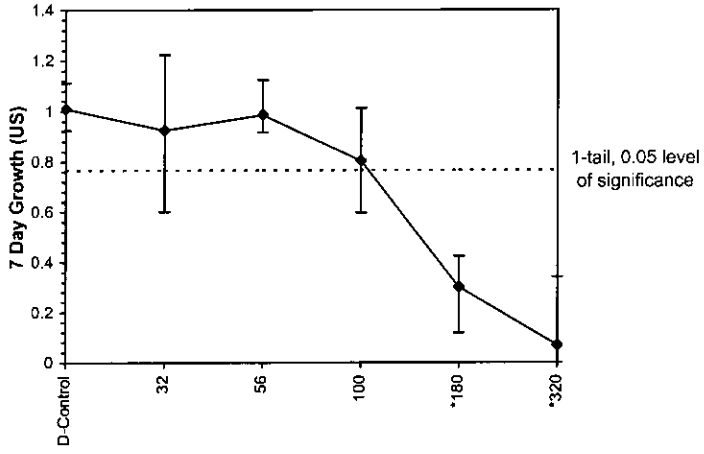
Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew
IC05*	27.42	22.74	0.00	93.30	0.4541
IC10	68.32	24.38	0.00	122.43	-0.2058
IC15	83.12	21.17	0.00	125.48	-0.8306
IC20	97.92	15.93	48.64	127.61	-0.9650
IC25	106.90	12.35	63.02	133.27	-0.3411
IC40	130.97	9.49	95.73	153.51	-0.4555
IC50	147.03	8.36	119.23	169.15	-0.1133

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: August 17/04

APPENDIX B

Chain-of-Custody Form

AZIMUTH (POLARIS)

CHAIN-OF-CUSTODY/TEST REQUEST FORM

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

Tel: (604) 986-4331
Fax: (604) 662-8548
www.evsenvironment.com

Client Name: Teck Cominco
Client Contact: Bruce Donald
Ship to:

Address: Bag 2000
Kimberley, BC
V1A 3E1
Phone: 250 427-8405
Fax: 250 427-8451
Sampled by: Dennis Lu
Attn:
Shipping Date:

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	3 Sample Container Type by Code	Test(s) Requested: 96h LC50 Rainbow Trout	Test(s) Requested: Topsmelt / Echinoderm	Test(s) Requested: D. magna 48h LC50	Test(s) Requested	Test(s) Requested	4 Sample Notes (e.g. preserved, saltwater, freshwater, may contain sewage)
~~07/Jul/2004~~	~~22:00~~	~~G-Creek_070704~~											
07/Jul/2004	22:00	G-Creek_comte_070704	E		G	2x20L		X		X			
07/Jul/2004	22:00	G-Creek_sed_070704	E		G	3x20L			X				

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by:	Date:	2) Released by:	Date:
Company:	Time:	Company:	Time:
Courier name:		Courier name:	
1) Received: JGK	Date: 10 Jul 04	2) Received by:	Date:
Company: EVS	Time: 1425	Company:	Time:

Shaded area to be completed by EVS Laboratory upon sample receipt.

EVS Project No. 04-0302-54
EVS Work Order (WO) No. 0400302/303/304/307
EOH TOBM. RBT DAPH.
Condition Upon Receipt GOOD
Receipt Sample Temp. (C) 11-6°

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, yellow - accompany the shipment
Pink - kept by consignor (e.g., shipper)
Yellow - kept by consignee (e.g., receiver)
White - returned to consignor by consignee

Please see instructions for completion on back of form.

Revision Date: March 6, 2004

September 2004

LABORATORY REPORT

Azimuth Consulting Group

POLARIS MINE

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

July 30, 2004

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
A Member of the Golder Group of Companies
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

July 30, 2004

LABORATORY REPORT

Prepared for

Azimuth Consulting Group
218-2902 W. Broadway
Vancouver, BC
V6K 2G8

Prepared by

EVS Environment Consultants - A Member of the Golder Group of Companies
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

09-0302-54

September 2004

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ACKNOWLEDGEMENTS

The *A. affinis* toxicity test was conducted by Andy Diewald, Ann-Marie Norris and Jenny Shao. Kathryn Sentance and Armando Tang performed the *D. excentricus* fertilization toxicity test. Statistical analyses were performed by Jenny Shao and Kathryn Sentance. The report was written by Kathryn Sentance and reviewed by Edmund Canaria. Quality Assurance/Quality Control (QA/QC) review on the *D. excentricus* test was conducted by Julianna Kalokai and Armando Tang reviewed the *A. affinis* toxicity test.

1. INTRODUCTION

EVS Environment Consultants conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as G Creek, was collected from the Polaris Mine Site on July 27, 2004 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on July 30, 2004 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. Toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. The raw data and statistical analyses are provided in Appendix A and B respectively, and the chain-of-custody form is provided in Appendix C.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d toxicity test and reference toxicant test using topsmelt (A. *affinis*) was conducted in accordance with EVS Environment Consultants Standard Operating Procedures (SOP) 1100-4 (EVS, 2002) with modifications based on U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The echinoderm (*Dendraster excentricus*) fertilization toxicity test was conducted in accordance with Environment Canada (1992 with 1997 amendments). Test conditions and methods summarized in Table 2.

This fertilization test involves exposing echinoderm sperm to a series of test concentrations for ten minutes, echinoderm eggs are then added allowing fertilization to occur for ten minutes. Following the ten minutes exposure time the eggs are preserved and the number of fertilized and unfertilized eggs in each replicate are counted. These observations are assessed in comparison to the pooled negative and brine controls.

2.3 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994).

2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general

QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and record-keeping, and use of standard operating procedures (SOPs). To ensure the highest quality of data and reporting, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	10d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5µm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.3, 8.6, 17.3, 34.5, 69.0% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

Table 2. Echinoderm (*Dendraster excentricus*) fertilization toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static
Test duration	10:10 min
Test chamber	16 X 125 mm test tubes
Test solution volume	10 mL
Number of replicate chambers per treatment	4
Number of eggs per test chamber	2000
Age of test organisms	< 4 hours after spawning
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity adjusted
Control/dilution water	UV-sterilized and 0.5µm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.6, 9.1, 18.3, 36.6, 73.1% (v/v)
Renewal of dilutions	None
Aeration	None during testing
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and conductivity daily; hardness and alkalinity at test initiation
Temperature	15 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Ambient laboratory illumination (moderate intensity)
Reference toxicant	Initiated concurrently with test; same test methods as above using SDS to generate an EC50 value; results compared to lab mean ± 2 SD
Endpoint	Fertilization of eggs
Test validity	≥ 50% and ≤ 100% mean control fertilization
Reference protocols	Environment Canada (1992), (EPS/1/RM/27 with 1997 amendments)

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The test results are summarized in Table 1 and the raw statistical analyses are provided in Appendix A.

The highest concentration tested was 69.0% due to salinity adjustment. The mean survival in both the negative and brine controls was 100%. The negative and brine controls were not significantly different for the growth and survival endpoints (p =1.00 and p =0.93, respectively).

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival in all tested concentrations relative to the pooled controls ($p \leq 0.05$). Adverse effects for growth were observed in the 17.3 and 69.0% (v/v) concentrations. For the survival and growth endpoints the NOEC was 69.0 and 8.6, and the LOEC was >69.0 and 17.3% (v/v), respectively. The LC50 for survival was >69.0% (v/v). The IC50 and IC25 for growth were both >69.0% (v/v)

3.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The test results are summarized in Table 2 and the raw statistical analyses are provided in Appendix B.

The highest concentration tested was 73.1% due to salinity adjustment. Mean fertilization in the pooled controls was 59.9%. The negative and brine controls were not significantly different (p =0.72).

The *D. excentricus* fertilization toxicity test exhibited adverse effects on egg fertilization in all except the lowest (4.6%(v/v)) test concentrations relative to the pooled controls ($p \leq 0.05$). The NOEC was 4.6 and LOEC was 9.1 %(v/v). The IC50 and IC25 (95% confidence limits) values were 37.3 (24.4 – 46.0) and 8.7 (7.6 – 9.9) %(v/v), respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point

estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

Table 3. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% v/v)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
D-Control	100.0 ± 0.0	0.98 ± 0.09
Brine Control	100.0 ± 0.0	0.99 ± 0.14
Pooled Controls	100.0 ± 0.0	0.98 ± 0.11
4.3	96.0 ± 8.9	0.91 ± 0.15
8.6	96.0 ± 8.9	0.87 ± 0.14
17.3	100.0 ± 0.0	0.78 ± 0.14*
34.5	100.0 ± 0.0	0.90 ± 0.03
69.0	96.0 ± 8.9	0.77 ± 0.19*
TEST ENDPOINT	**SURVIVAL (% v/v)**	**GROWTH (% v/v)**
NOEC	69.0	8.6
LOEC	>69.0	17.3
LC50	>69.0	na
IC50	na	>69.0
IC25	na	>69.0

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; na – not applicable.

Table 4. Summary of results for the Echinoderm (*Dendraster excentricus*) fertilization toxicity test

TEST CONCENTRATION (% v/v)	PROPORTION FERTILIZED (%) (MEAN ± SD)
Negative Control	60.0 ± 4.1
Brine Control	60.0 ± 2.1
Pooled Control	60.0 ± 3.0
4.6	60.0 ± 4.3
9.1	43.8 ± 2.1*
18.3	37.0 ± 1.4*
36.6	30.2 ± 3.8*
73.1	20.0 ± 0.8*
TEST ENDPOINT	**PROPORTION FERTILIZED %(v/v)**
NOEC	4.6
LOEC	9.1
IC50 (95% CL)	37.3 (24.4 – 46.0)
IC25 (95% CL)	8.7 (7.6 – 9.9)

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; CL – Confidence Limits.

4. REFERENCES

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Tidepool Scientific Software. 1994. TOXCALC: Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.23. Tidepool Scientific Software, McKinleyville, CA. 80 pp.

APPENDIX A

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth (Polaris) | EVS Analysts AWD. JES. AKN

EVS Project No. 09-0302-54

EVS Work Order No. 0400339 | Test Initiation Date July 30, 2004

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	G-Creek - sublethal - 27704		
Amount Received	20 L		
Date Collected	July 27, 2004		
Date Received	July 30, 2004		
Temperature (°C)	20.0 D→ 20.0		
pH	7.8 D→ 8.3		
DO (mg/L)	10.7 D→ 7.4		
Conductivity (µmhos/cm)	4880		
Salinity (ppt)	2.6 D→ 28		
Ammonia (mg/L N)	—		
Chlorine (mg/L Cl)	—		
Other	0 Brine adjusted to 30±2 ppt with 90 ppt HSB		

DILUTION/CONTROL WATER (initial water quality)

Water Type Filtered, UV sterilized seaH2O

Temperature (°C) 20.0

pH 8.1

Dissolved Oxygen (mg/L) 7.4

Salinity 28 ppt

TEST SPECIES INFORMATION

Source Aquatic Biosystems (ABS)

Date Received July 29, 2004

Age (on Day 0) 10-d

Reference Toxicant Cu

Current Reference Toxicant Result (incl. 95% CL)

Reference Toxicant Test Date July 30, 2004

7-d survival LC50 130 (115-147) mg/L Cu

7-d growth IC50 124 (87-144) mg/L Cu

Reference Toxicant Warning Limits (mean ± 2SD) and CV

7-d survival LC50 129 ± 48 mg/L Cu. CV=19%

7-d growth IC50 130 ± 52 mg/L Cu. CV=20%

TEST CONDITIONS

Temperature Range (°C) 20.0-20.5

pH Range 7.8-8.1

Dissolved Oxygen Range (mg/L) 6.4-7.7

Salinity (ppt) 28

Photoperiod (L:D h) 16:8

Aeration Provided? NA

Other —

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	% (v/v)	69	>69	>69		
Growth		8.6 ~~34.5~~	17.3 ~~69~~		>69	>69

Other

Data Verified By [signature] | Date Verified Sept. 16/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth (Polaris) Sample ID G-Creek - Acute - 270704

EVS Project No. 09-0302-54 Test Initiation Date/Time July 30/1500 h

EVS Work Order No. 0400339 Source/Date Received ABS / July 29/04

Concentration (%)	Temperature (°C)													
	0	1 old	1 new	2		3		4		5		6		7
Neg. CTL	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
B-CTL	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
4.3	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
8.6	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
17.3	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
34.5	20.0	20.5	20.0	20.5	20.0	20.6	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
69	20.0	20.5	20.0	20.5	20.0	20.6	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
Tech. Initials	JES													

Concentration (%)	pH													
	0	1		2		3		4		5		6		7
Neg. CTL	8.1	8.1	7.9	7.9	8.0	8.0	7.9	8.0	7.8	8.0	7.8	7.9	8.0	7.9
B-CTL	8.1	8.1	7.9	7.9	8.0	7.9	7.9	8.0	7.8	8.0	7.8	7.9	8.0	7.9
4.3	8.2	8.0	8.1	8.1	8.1	7.9	8.1	7.9	8.1	7.9	8.1	8.0	8.1	8.0
8.6	8.2	8.1	8.2	8.2	8.1	8.1	8.2	8.1	8.1	8.0	8.2	8.1	8.1	8.1
17.3	8.2	8.1	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.1
34.5	8.2	8.1	8.3	8.3	8.2	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.3	8.2
69	8.3	8.2	8.4	8.4	8.4	8.3	8.3	8.3	8.4	8.3	8.7	8.4	8.3	8.2
Tech. Initials	JES													

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51

Comments

Test Set Up By AWD. JES. AKN Data Verified By [signature] Date Verified Sept. 13/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth (Polaris) Sample ID G - Creek - Anuke - 270704

EVS Project No. 09-0302-54 Test Initiation Date/Time July 30 / 15:00 h

EVS Work Order No. 0400339 Source/Date Received ABS / July 29/04

Concentration % (v/v)	Salinity (ppt)							
	0	1	2	3	4	5	6	7
Neg-CTL	28	28	28	28	28	28	28	28
B-CTL	28	28	28	28	28	28	28	28
4.3	28	28	28	28	28	28	28	28
8.6	28	28	28	28	28	28	28	28
17.3	28	28	28	28	28	28	28	28
34.5	28	28	28	28	28	28	28	28
69	28	28	28	28	28	28	28	28
Tech. Initials	JES	~	~	~	~	~	~	~

Concentration % (v/v)	Dissolved Oxygen (mg/L)													
	0	1		new 2 old		3		4		5		6		7
Neg. CTL	7.4	6.6	7.4	7.5	6.8	7.4	7.0	7.5	7.0	7.6	6.8	6.7	7.6	6.8
B-CTL	7.4	6.8	7.4	7.5	6.7	7.4	6.9	7.5	6.9	7.6	6.7	6.6	7.6	6.9
4.3	7.4	6.7	7.4	7.5	6.8	7.4	6.8	7.5	6.8	7.6	6.7	6.6	7.6	6.9
8.6	7.4	6.8	7.0	7.5	6.9	7.4	6.8	7.5	6.8	7.6	6.7	6.5	7.7	6.8
17.3	7.4	6.9	7.4	7.5	6.8	7.4	6.6	7.5	6.5	7.6	6.8	6.6	7.7	6.7
34.5	7.4	6.7	7.4	7.5	6.7	7.4	6.7	7.5	6.4	7.6	6.8	6.7	7.7	6.7
69	7.4	6.7	7.4	7.4	6.7	7.4	6.7	7.5	6.4	7.6	6.8	6.7	7.7	6.7
Tech. Initials	JES	~	~	~	~	~	~	~	~	~	~	~	~	~

WQ Instruments Used: Salinity II-A-030304 DO II-A-011202

Comments

Test Set Up By AWD, JES, AKN Data Verified By Qualified Date Verified Sept 13/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client Azimuth (Polaris)
EVS Project No. 09-0302-54
EVS Work Order No. 0400339

Start Date (Day 0) July 30/04
Sample ID G-Creek - Acute - 270704
Balance Type/Serial Number Sartorius BP211D

Sample ID % v/v	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
Neg. CTL	A	A 1	1239.31	1244.31	5	5		JBA JWS/AD
	B	A 2	1249.28	1254.89	5	5		
	C	A 3	1245.80	1250.56	5	5		
	D	A 4	1249.65	1254.46	5	5		
	E	A 5	1272.31	1276.64	5	5		
Brine CTL	A	A 6	1247.06	1252.91	5	5		
	B	A 7	1253.79	1257.85	5	5	confirmed 1257.82 ✓	
	C	A 8	1281.77	1286.98	5	5		
	D	A 9	1251.58	1255.98	5	5		
	E	A 10	1259.93	1265.08	5	5		
4.3	A	A 11	1257.42	1261.19	4	4		
	B	A 12	1236.86	~~1242.25~~	5	5	confirmed 1242.19 ✓	
	C	A 13	1239.81	1244.13	5	5		
	D	A 14	1242.95	1246.92	5	5		
	E	A 15	1235.71	1239.91	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By Ralph

Date Verified Sept. 13/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client Azimuth (Polaris)
EVS Project No. 09-0302-54
EVS Work Order No. 0400339

Start Date (Day 0) July 30, 2004
Sample ID G-Creek - Acute - 270704
Balance Type/Serial Number Sartorius BP 211D

Sample ID % %N	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
8.6	A	A16	1227.02	1232.51	5	5		
	B	A17	1239.24	1243.57	5	5		
	C	A18	1229.02	1233.44	4	4		
	D	A19	1233.84	1237.47	5	5		
	E	A20	1228.86	1232.75	5	5	confirmed 1232.80 ✓	
17.3	A	A21	1231.20	1234.75	5	5		
	B	A22	1233.22	1237.19	5	5		
	C	A23	1222.38	1227.10	5	5		
	D	A24	1222.20	1225.18	5	5		
	E	A25	1226.00	1230.36	5	5		
34.5	A	A26	1225.11	1229.67	5	5		
	B	A27	1233.99	1238.36	5	5		
	C	A28	1237.10	1241.69	5	5	confirmed 1241.64 ✓	
	D	A29	1222.42	1226.65	5	5		
	E	A30	1233.63	1238.25	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By Ralph K

Date Verified Sept. 13/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400339

Start Date (Day 0): July 30/04
Sample ID: G-Creek - Acute - 270704
Balance Type/Serial Number: Sartorius BP211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
69	A	A31	1239.64	1242.07	4	4		~~JJ~~
	B	A32	1237.11	1241.20	5	5		
	C	A33	1231.11	1234.89	5	5		
	D	A34	1239.84	1243.88	5	5		
	E	A35	1233.50	1238.50	5	5	confirmed 1238.46 ✓	

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: Sept. 13/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Mine)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400339

Sample ID: G-Creek - Grab - 270704
Test Species/Batch: A. affinis
Test Initiation Date/Time: July 30 / 15:00 2004
No. of Organisms/Volume: 5 / 200 ml

Concentration % v/v	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
Neg. CTL	A		5	5	5	5	5	5	5	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	5	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
B-CTL	A		5	5	5	5	5	5	5	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	5	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
4.3	A		5	5	5	5	5	5	4	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	5	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
8.6	A		5	5	5	5	5	5	5	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	4	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
Technician Initials										

Sample Description: clear, colorless
Data Verified By: [signature]
Date Verified: Sept. 15/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Mine)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400339

Sample ID: G-Creek - Acute - 270704
Test Species/Batch: A. affinis / July 29, 04
Test Initiation Date/Time: July 30 / 15:00
No. of Organisms/Volume: 5/200ml

Concentration %	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
17.3	A		5	5	5	5	5	5	5	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	5	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
34.5	A		5	5	5	5	5	5	5	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	5	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
69	A		5	5	5	5	4	4	4	
	B		5	5	5	5	5	5	5	
	C		5	5	5	5	5	5	5	
	D		5	5	5	5	5	5	5	
	E		5	5	5	5	5	5	5	
	A									
	B									
	C									
	D									
	E									
Technician Initials										

Sample Description: clear colorless
Data Verified By: Qualified
Date Verified: Sept 15/04

Test: LF-Larval Fish Growth and Survival Test | Test ID: 0400339
Species: AA-Atherinops affinis | Protocol: EPAW 95-EPA West Coast
Sample ID: G-Creek-sublethal-270704 | Sample Type: EFF2-Industrial
Start Date: 7/30/2004 End Date: 8/6/2004 | Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	Neg Control	5							5	5	1244.31	1239.31
	2	2	Neg Control	5							5	5	1254.89	1249.28
	3	3	Neg Control	5							5	5	1250.56	1245.8
	4	4	Neg Control	5							5	5	1254.46	1249.65
	5	5	Neg Control	5							5	5	1276.64	1272.31
	6	1	Brine Control	5							5	5	1252.91	1247.06
	7	2	Brine Control	5							5	5	1257.85	1253.79
	8	3	Brine Control	5							5	5	1286.98	1281.77
	9	4	Brine Control	5							5	5	1255.98	1251.58
	10	5	Brine Control	5							5	5	1265.08	1259.93
	11	1	4.300	5							4	4	1261.19	1257.42
	12	2	4.300	5							5	5	1242.25	1236.86
	13	3	4.300	5							5	5	1245.13	1239.81
	14	4	4.300	5							5	5	1246.92	1242.85
	15	5	4.300	5							5	5	1239.91	1235.71
	16	1	8.600	5							5	5	1232.51	1227.02
	17	2	8.600	5							5	5	1243.57	1239.24
	18	3	8.600	5							4	4	1233.44	1229.02
	19	4	8.600	5							5	5	1237.47	1233.84
	20	5	8.600	5							5	5	1232.75	1228.86
	21	1	17.300	5							5	5	1234.75	1231.2
	22	2	17.300	5							5	5	1237.19	1233.22
	23	3	17.300	5							5	5	1227.1	1222.38
	24	4	17.300	5							5	5	1225.18	1222.2
	25	5	17.300	5							5	5	1230.36	1226
	26	1	34.500	5							5	5	1229.67	1225.11
	27	2	34.500	5							5	5	1238.36	1233.99
	28	3	34.500	5							5	5	1241.69	1237.1
	29	4	34.500	5							5	5	1226.65	1222.38
	30	5	34.500	5							5	5	1238.25	1233.63
	31	1	69.000	5							4	4	1242.07	1239.64
	32	2	69.000	5							5	5	1241.2	1237.11
	33	3	69.000	5							5	5	1234.89	1231.11
	34	4	69.000	5							5	5	1243.88	1239.84
	35	5	69.000	5							5	5	1238.5	1233.5

Comments: Azimuth(Polaris Mine)09-0302-54

Reviewed by: 8/17/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/30/2004	Test ID:	400339	Sample ID:	G-Creek-sublethal-270704
End Date:	8/6/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	7/27/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54				

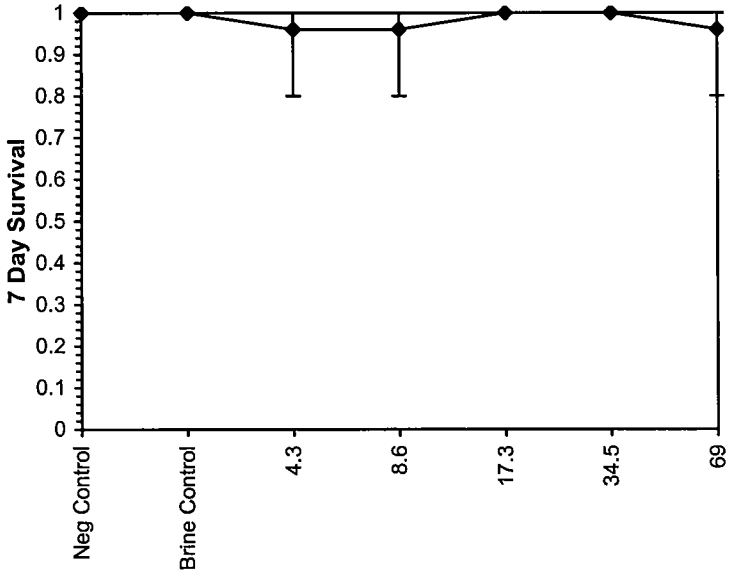
Conc-%	1	2	3	4	5
Neg Control	1.0000	1.0000	1.0000	1.0000	1.0000
Brine Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.3	0.8000	1.0000	1.0000	1.0000	1.0000
8.6	1.0000	1.0000	0.8000	1.0000	1.0000
17.3	1.0000	1.0000	1.0000	1.0000	1.0000
34.5	1.0000	1.0000	1.0000	1.0000	1.0000
69	0.8000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Neg Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
Brine Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
4.3	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
8.6	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
17.3	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
34.5	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
69	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.59678	0.9	-2.2346	4.3922
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	69	>69		1.44928

Dose-Response Plot



Statistical comparisons were against the D-Control only

Reviewed by: Galfi 4
Sent · 15/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/30/2004	Test ID:	400339	Sample ID:	G-Creek-sublethal-270704
End Date:	8/6/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	7/27/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54				

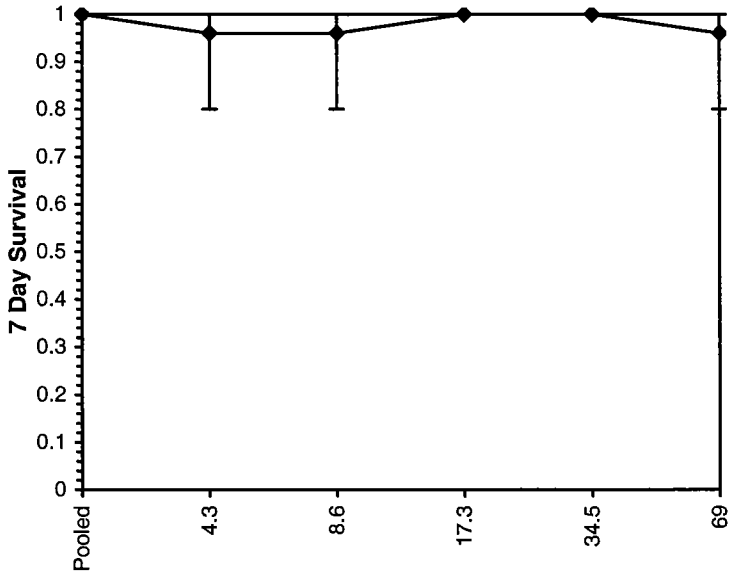
Conc-%	1	2	3	4	5
Neg Control	1.0000	1.0000	1.0000	1.0000	1.0000
Brine Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.3	0.8000	1.0000	1.0000	1.0000	1.0000
8.6	1.0000	1.0000	0.8000	1.0000	1.0000
17.3	1.0000	1.0000	1.0000	1.0000	1.0000
34.5	1.0000	1.0000	1.0000	1.0000	1.0000
69	0.8000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Pooled	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	10		
4.3	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
8.6	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
17.3	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
34.5	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
69	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.58129	0.91	-2.3952	5.50568
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	69	>69		1.44928

Dose-Response Plot



Statistical comparisons were against the Pooled control.

Reviewed by: Galfi
Sent. 16/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/30/2004	Test ID:	400339	Sample ID:	G-Creek-sublethal-270704
End Date:	8/6/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	7/27/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54				

Conc-%	1	2	3	4	5
Neg Control	1.0000	1.1220	0.9520	0.9620	0.8660
Brine Control	1.1700	0.8120	1.0420	0.8800	1.0300
4.3	0.7540	1.0780	1.0640	0.8140	0.8400
8.6	1.0980	0.8660	0.8840	0.7260	0.7780
17.3	0.7100	0.7940	0.9440	0.5960	0.8720
34.5	0.9120	0.8740	0.9180	0.8540	0.9240
69	0.4860	0.8180	0.7560	0.8080	1.0000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Neg Control	0.9804	0.0931	0.9804	0.8660	1.1220	9.496	5				0.9804	1.0000
Brine Control	0.9868	0.1418	0.9868	0.8120	1.1700	14.370	5					
4.3	0.9100	0.1503	0.9100	0.7540	1.0780	16.519	5	0.840	2.360	0.1979	0.9100	0.9282
8.6	0.8704	0.1426	0.8704	0.7260	1.0980	16.389	5	1.312	2.360	0.1979	0.8704	0.8878
17.3	0.7832	0.1363	0.7832	0.5960	0.9440	17.397	5	2.352	2.360	0.1979	0.8398	0.8566
34.5	0.8964	0.0307	0.8964	0.8540	0.9240	3.425	5	1.002	2.360	0.1979	0.8398	0.8566
*69	0.7736	0.1854	0.7736	0.4860	1.0000	23.961	5	2.466	2.360	0.1979	0.7736	0.7891

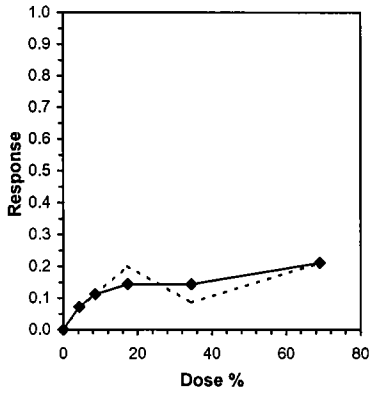
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97283	0.9	-0.0321	0.12793
Bartlett's Test indicates equal variances (p = 0.10)	9.1539	15.0863		
The control means are not significantly different (p = 0.93)	0.08436	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	34.5	69	48.7904	2.89855	0.1979	0.20186	0.03131	0.01758	0.15497	5, 24

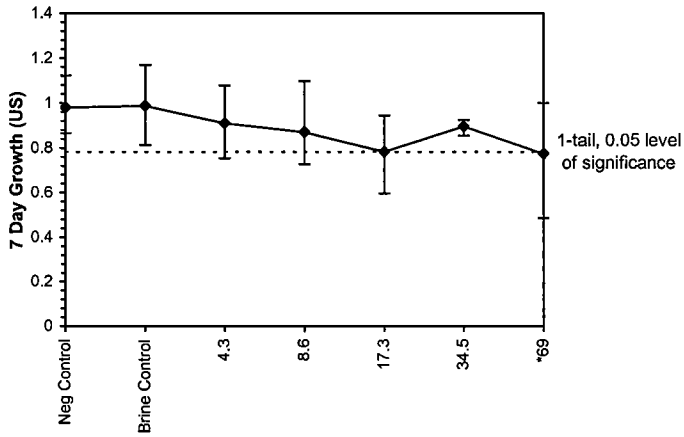
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	2.994	3.701	0.790	14.903	3.3103
IC10	7.301				
IC15	37.867				
IC20	63.413				
IC25	>69				
IC40	>69				
IC50	>69				

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Statistical comparisons were against the D-Control only

Reviewed by Sept. 15-'04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/30/2004	Test ID:	400339	Sample ID:	G-Creek-sublethal-270704
End Date:	8/6/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	7/27/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris Mine)09-0302-54				

Conc-%	1	2	3	4	5
Neg Control	1.0000	1.1220	0.9520	0.9620	0.8660
Brine Control	1.1700	0.8120	1.0420	0.8800	1.0300
4.3	0.7540	1.0780	1.0640	0.8140	0.8400
8.6	1.0980	0.8660	0.8840	0.7260	0.7780
17.3	0.7100	0.7940	0.9440	0.5960	0.8720
34.5	0.9120	0.8740	0.9180	0.8540	0.9240
69	0.4860	0.8180	0.7560	0.8080	1.0000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.9836	0.1131	0.9836	0.8120	1.1700	11.503	10				0.9836	1.0000
4.3	0.9100	0.1503	0.9100	0.7540	1.0780	16.519	5	1.021	2.462	0.1775	0.9100	0.9252
8.6	0.8704	0.1426	0.8704	0.7260	1.0980	16.389	5	1.570	2.462	0.1775	0.8704	0.8849
*17.3	0.7832	0.1363	0.7832	0.5960	0.9440	17.397	5	2.780	2.462	0.1775	0.8398	0.8538
34.5	0.8964	0.0307	0.8964	0.8540	0.9240	3.425	5	1.209	2.462	0.1775	0.8398	0.8538
*69	0.7736	0.1854	0.7736	0.4860	1.0000	23.961	5	2.913	2.462	0.1775	0.7736	0.7865

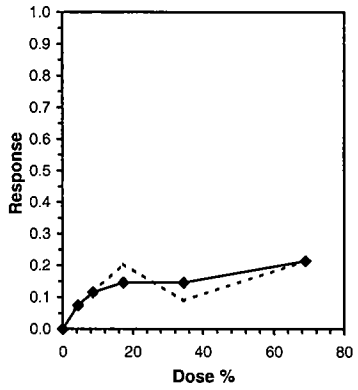
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97705	0.91	-0.0216	-0.1535
Bartlett's Test indicates equal variances (p = 0.11)	8.86442	15.0863		
The control means are not significantly different (p = 0.93)	0.08436	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	8.6	17.3	12.1975	11.6279	0.1775	0.18046	0.04318	0.01733	0.05389	5, 29

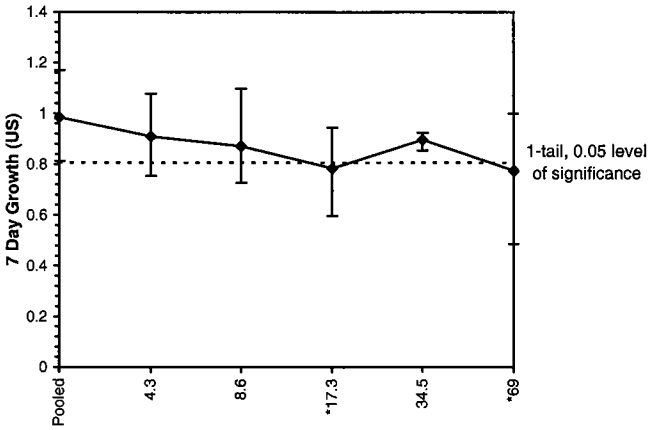
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	2.873	2.982	0.771	15.235	1.2072
IC10	6.989				
IC15	36.449				
IC20	62.079				
IC25	>69				
IC40	>69				
IC50	>69				

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Statistic comparisons were against the pooled control.

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth (Polaris) EVS Analysts JLS, AWD
EVS Project No. 09-0302-54
EVS Work Order No. 0400339 Test Initiation Date July 30, 2004

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	04-Cu-001		
Amount ~~Received~~	1 L		
Date ~~Collected~~ Prepared	March-15, 04		
Date Received			
Temperature (°C)			
pH			
DO (mg/L)			
Conductivity (µmhos/cm)			
Salinity (ppt)			
Ammonia (mg/L N)			
Chlorine (mg/L Cl)			
Other			

DILUTION/CONTROL WATER (initial water quality)
Water Type UV sterilized, filtered SW
Temperature (°C) 20.0
pH 8.1
Dissolved Oxygen (mg/L) 7.4
Salinity 28 ppt

TEST SPECIES INFORMATION
Source Aquatic Biosystems (ABS)
Date Received July 29, 2004
Age (on Day 0) 10-d
Reference Toxicant Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date July 30, 04
7-d survival LC50 130 (115-147) mg/L Cu
7-d growth IC50 ~~119 (89-138)~~ 124 (87-144) mg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 129 ± 48 mg/L Cu. CV = 19%
7-d growth IC50 130 ± 52 mg/L Cu. CV = 20%

TEST CONDITIONS
Temperature Range (°C) 20.0 - 20.5
pH Range 7.8 - 8.1
Dissolved Oxygen Range (mg/L) 6.4 - 7.6
Salinity (ppt) 28
Photoperiod (L:D h) 16:8
Aeration Provided? NA
Other —

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	mg/L Cu	100	180	130 (115-147)		
Growth		56	100		~~119 (89-138)~~ 124 (87-144)	~~82 (0.4-124)~~ 85 (~~127~~ 73.6-127)

Other

Data Verified By [signature] Date Verified Sept. 13/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris) | Sample ID: Cu reftox

EVS Project No.: 09-0302-54 | Test Initiation Date/Time: July 30/04 / 1430 h

EVS Work Order No.: 0400339 | Source/Date Received: ABS / July 29, 2004

Concentration Cu mg/L	Temperature (°C)													
	0	old 1	new	2		3		4		5		6		7
Neg. CTL.	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
32	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
56	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
100	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
180	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
320	20.0	20.5	20.0	20.5	20.0									
Tech. Initials	JW	~	~	~	~	~	~	~	~	~	~	~	~	~

Concentration Cu mg/L	pH													
	0	1		2		3		4		5		6		7
Neg. CTL	8.1	8.0	7.9	7.9	8.0	7.9	8.0	7.8	8.0	7.8	8.0	8.0	7.9	7.8
32	8.1	8.0	7.9	7.9	8.0	7.9	8.1	7.8	8.0	7.8	8.1	8.0	7.9	7.8
56	8.1	7.9	7.9	7.9	8.0	7.9	8.1	7.8	8.0	7.8	8.1	8.0	7.9	7.9
100	8.1	7.9	7.9	7.9	8.0	7.9	8.1	7.8	7.9	7.8	8.0	8.0	7.8	7.9
180	8.1	7.9	7.9	7.9	8.0	7.9	8.1	7.8	7.9	7.8	8.1	8.0	7.9	7.9
320	8.1	7.9	7.9	7.9	8.0									
Tech. Initials	JW	~	~	~	~	~	~	~	~	~	~	~	~	~

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51

Comments

Test Set Up By: JW/AS Data Verified By: [signature] Date Verified: Sept. 10/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth | Sample ID Cu · reftox

EVS Project No. 09-0302-54 | Test Initiation Date/Time July 30, 2004 / 1430 h

EVS Work Order No. 0400339 | Source/Date Received ABS / July 29, 04

Concentration Cu mg/L	Salinity (ppt)							
	0	1	2	3	4	5	6	7
Neg. CTL	28	28	28	28	28	28	28	28
32	28	28	28	28	28	28	28	28
56	28	28	28	28	28	28	28	28
100	28	28	28	28	28	28	28	28
180	28	28	28	28	28	28	28	28
320	28	28	28	—	—	—	—	—
Tech. Initials	JKS	~	~	~	~	~	~	

Concentration Cu mg/L	Dissolved Oxygen (mg/L)													
	0	1		2 new old		3		4		5		6		7
Neg. CTL	7.4	7.0	7.4	7.5	6.7	7.0	7.4	7.0	7.5	6.8	7.6	6.4	7.~~6~~	6.7
32	7.4	6.9	7.4	7.5	6.7	6.8	7.4	6.9	7.5	6.9	7.6	6.6	7.6	6.8
56	7.4	6.9	7.4	7.5	6.8	6.8	7.4	6.7	7.5	7.0	7.6	6.7	7.6	6.7
100	7.4	6.8	7.4	7.5	6.8	6.7	7.4	6.5	7.5	6.9	7.6	6.4	7.6	6.8
180	7.4	6.8	7.4	7.5	6.7	6.7	7.4	6.4	7.5	6.8	7.6	6.6	7.6	6.8
320	7.4	6.8	7.4	7.5	6.7	~~6.8~~	~~7.4~~	—	—	—	—	—	—	—
Tech. Initials	JKS	~	~	~	~	~	~	~	~	~	~	~	~	~

WQ Instruments Used: Salinity II-A030304 | DO II-A-011202

Comments

Test Set Up By JKS/AWD | Data Verified By Qualich | Date Verified Sept. 10/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris Mine)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400339

Sample ID: Cu (Reflox)
Test Species/Batch: A. affinis / July 29, 2004
Test Initiation Date/Time: July 30, 2004 / 1430 h
No. of Organisms/Volume: 5/200ml

Cu ug/L Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
Neg. CTL	A	A 36	5	5	5	5	5	5	5	
	B	37	5	5	5	5	5	5	5	
	C	38	5	5	5	5	5	5	5	
	D	39	5	5	5	5	5	5	5	
	E	40	5	5	5	5	5	5	5	
32	A	41	5	5	5	5	5	5	5	
	B	42	5	5	5	5	5	5	5	
	C	43	5	5	5	4	4	4	4	
	D	44	5	5	5	5	5	5	M/5	
	E	45	5	5	5	5	5	5	5	
56	A	46	5	5	5	5	5	5	5	
	B	47	5	5	5	5	5	4	4	
	C	49	5	5	5	5	5	5	5	
	D	50	5	5	5	5	5	5	5	
	E	51	5	5	5	5	5	5	5	
100	A	52	4	3	3	3	3	3	3	
	B	53	4	4	4	4	4	4	4	
	C	54	5	5	5	5	5	5	5	
	D	55	5	5	5	5	5	5	5	
	E	56	5	5	5	4	4	4	4	
Technician Initials										

Sample Description: clear, colorless
Data Verified By: [signature]
Date Verified: Sept. 13/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Azimuth (Polaris Mine)
EVS Project No. 09-0302-54
EVS Work Order No. 0400339

Sample ID Cu reflux
Test Species/Batch A. affinis / July 29, 2004
Test Initiation Date/Time July 30, 04/1430 h
No. of Organisms/Volume 5/200ml

Cu µg/L Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
180	A	~~A5~~	2	1	0	—	—	—	—	
	B	—	2	2	1	1	0	—	—	
	C	A58	4	4	2	2	2	2	2	
	D	A59	2	1	1	1	1	1	1	
	E	—	2	2	2	1	0	—	—	
320	A	—	1	0	—	—	—	—	—	
	B	—	0	—	—	—	—	—	—	
	C	—	0	—	—	—	—	—	—	
	D	—	0	—	—	—	—	—	—	
	E	—	0	—	—	—	—	—	—	
	A									
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									
Technician Initials										

Sample Description
Data Verified By Ralph H Date Verified Sept 13/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400339

Start Date (Day 0): July 30, 2004
Sample ID: Cu - reftox
Balance Type/Serial Number: Sartorius BP211D

Sample ID (Cu µg/L)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
Neg. CTL	A	A36	1225.46	1231.37	5	5		JDS/AD
	B	A37	1223.00	1227.74	5	5		
	C	A38	1227.28	1232.01	5	5		
	D	A39	1225.60	1232.35	5	5		
	E	A40	1231.361	1238.39	5	5	confirmed 1238.42 ✓	
32	A	A41	1223.15	1228.32	5	5		
	B	A42	1232.24	1238.17	5	5		
	C	A43	1228.15 (1228.29 TKD)	1232.39	4	4		
	D	A44	1228.67	1233.67	5	5		
	E	A45	1223.92	1228.14	5	5	Confirmed 1228.16 ✓	
56	A	A46	1224.29	1229.51	5	5		
	B	A47	1219.34	1223.14	4	4		
	C	A48	1223.19	12			RD	
	~~C~~ D	~~A49~~ A51	1224.29	1229.03	5	5		"
	~~ED~~	~~A50~~	1228.49	1234.94	5	5		"

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: Sept. 13/04

Forms\Lab\Datasheets\Larvalfish\Topsmelt\7D-DRYWEIGHT.DOC August 26, 2002

concentration	Pan #	pan wt	Final pan wt	# Survival	# Weighed
56 µg/L E	A51	1228.55	1233.48	5	5

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400339
Start Date (Day 0): July 30-04
Sample ID: Cu Effluent
Balance Type/Serial Number: Sartorius BP 211D

Sample ID Cu µg/L	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
100	A	A52	1229.80	1231.98	3	3		JAS µ
	B	A53	1230.92	1234.72	4	4		
	C	A54	1226.04	1230.33	5	5		
	D	A55	1228.91	1234.05	5	5	confirmed 1234.07 ✓	
	E	A56	1226.61	1231.21	4	4		
180	C	~~A58~~ A63 ^	~~1230.23~~ 1214.44 ^	1215.67	2	2		
	D	~~A59~~ A64 ^	~~1225.91~~ 1229.90 ^	1230.26	1	1		✓

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: Sept - 13/04

Test: LF-Larval Fish Growth and Survival Test | Test ID: RTAACu37
Species: AA-Atherinops affinis | Protocol: EPAW 95-EPA West Coast
Sample ID: REF-Ref Toxicant | Sample Type: CU-Copper
Start Date: 7/30/2004 End Date: 8/6/2004 | Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1231.37	1225.46
	2	2	D-Control	5							5	5	1227.74	1223
	3	3	D-Control	5							5	5	1232.01	1227.28
	4	4	D-Control	5							5	5	1232.35	1225.6
	5	5	D-Control	5							5	5	1238.39	1231.61
	6	1	32.000	5							5	5	1228.32	1223.15
	7	2	32.000	5							5	5	1238.17	1232.24
	8	3	32.000	5							4	4	1232.39	1228.15
	9	4	32.000	5							5	5	1233.67	1228.67
	10	5	32.000	5							5	5	1228.14	1223.92
	11	1	56.000	5							5	5	1229.51	1224.29
	12	2	56.000	5							4	4	1223.14	1219.34
	13	3	56.000	5							5	5	1229.03	1224.29
	14	4	56.000	5							5	5	1234.94	1228.49
	15	5	56.000	5							5	5	1233.48	1228.55
	16	1	100.000	5							3	3	1231.98	1229.8
	17	2	100.000	5							4	4	1234.72	1230.92
	18	3	100.000	5							5	5	1230.33	1226.04
	19	4	100.000	5							5	5	1234.05	1228.91
	20	5	100.000	5							4	4	1231.21	1226.61
	21	1	180.000	5							0	0	0	0
	22	2	180.000	5							0	0	0	0
	23	3	180.000	5							2	2	1215.67	1214.44
	24	4	180.000	5							1	1	1230.26	1229.9
	25	5	180.000	5							0	0	0	0
	26	1	320.000	5							0	0	0	0
	27	2	320.000	5							0	0	0	0
	28	3	320.000	5							0	0	0	0
	29	4	320.000	5							0	0	0	0
	30	5	320.000	5							0	0	0	0

Comments: 09-0302-54, 0400339

Reviewed by: 8/12/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/30/2004	Test ID:	RTAACu37	Sample ID:	REF-Ref Toxicant
End Date:	8/6/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	09-0302-54, 0400339				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
32	1.0000	1.0000	0.8000	1.0000	1.0000
56	1.0000	0.8000	1.0000	1.0000	1.0000
100	0.6000	0.8000	1.0000	1.0000	0.8000
180	0.0000	0.0000	0.4000	0.2000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

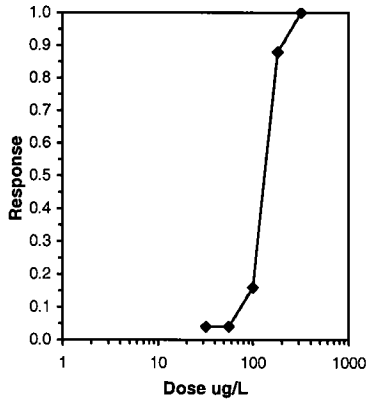
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5			0	25
32	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
56	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
100	0.8400	0.1673	1.1582	0.8861	1.3453	16.679	5	20.00	17.00	4	25
*180	0.1200	0.1789	0.3650	0.2255	0.6847	56.537	5	15.00	17.00	22	25
320	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5			25	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94287	0.888	0.10595	0.6692
Equality of variance cannot be confirmed				

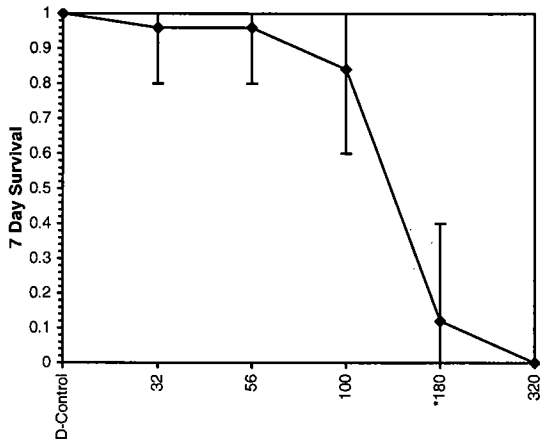
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	180	134.164	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%	129.88	114.75	146.99	
10.0%	130.93	116.99	146.54	
20.0%	131.99	121.77	143.08	
Auto-4.0%	129.69	114.60	146.77	ug/L Cu



Dose-Response Plot



Reviewed by: Galfit
Sept. 13/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/30/2004	Test ID:	RTAACu37	Sample ID:	REF-Ref Toxicant
End Date:	8/6/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	09-0302-54, 0400339				

Conc-ug/L	1	2	3	4	5
D-Control	1.1820	0.9480	0.9460	1.3500	1.3560
32	1.0340	1.1860	0.8480	1.0000	0.8440
56	1.0440	0.7600	0.9480	1.2900	0.9860
100	0.4360	0.7600	0.8580	1.0280	0.9200
180	0.0000	0.0000	0.2460	0.0720	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.1564	0.2035	1.1564	0.9460	1.3560	17.599	5				1.1564	1.0000
32	0.9824	0.1429	0.9824	0.8440	1.1860	14.543	5	1.534	2.300	0.2608	0.9940	0.8596
56	1.0056	0.1913	1.0056	0.7600	1.2900	19.023	5	1.330	2.300	0.2608	0.9940	0.8596
*100	0.8004	0.2257	0.8004	0.4360	1.0280	28.204	5	3.139	2.300	0.2608	0.8004	0.6921
*180	0.0636	0.1066	0.0636	0.0000	0.2460	167.649	5	9.636	2.300	0.2608	0.0636	0.0550
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97311	0.888	-0.2174	-0.3474
Bartlett's Test indicates equal variances (p = 0.67)	2.36564	13.2767		

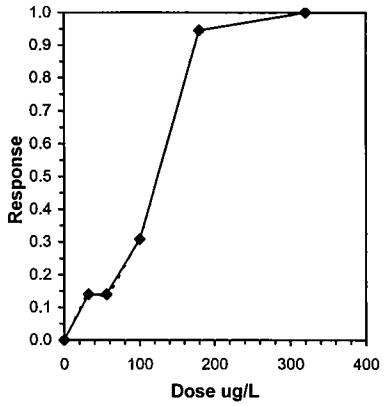
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	56	100	74.8331		0.26083	0.22555	0.93104	0.03215	4.6E-08	4, 20

Linear Interpolation (200 Resamples)

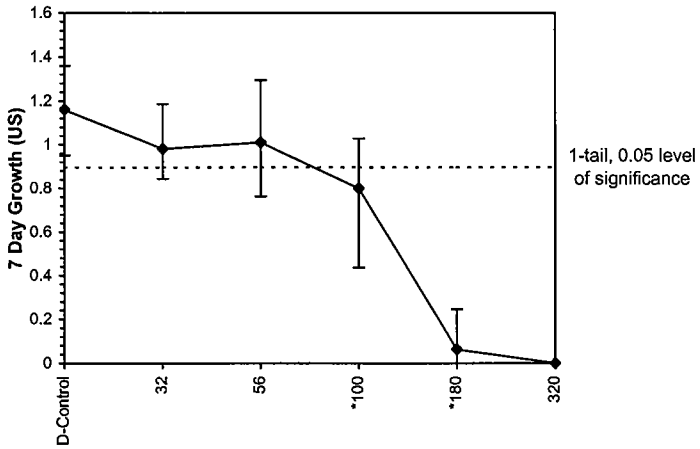
Point	ug/L	SD	95% CL(Exp)		Skew
IC05*	11.39	19.61	3.51	97.01	1.6113
IC10*	22.79	23.89	7.01	129.04	1.0634
IC15	58.51	26.81	0.00	126.48	0.4512
IC20	71.65	25.04	0.99	127.04	-0.1836
IC25	84.80	21.56	3.62	127.36	-0.5667
IC40	111.57	11.06	71.01	135.64	-0.6491
IC50	124.13	9.44	86.97	143.83	-0.7596

ug/L Cu

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Reviewed by Gail H 4 Sept. 13/04

APPENDIX B

Raw Data and Statistical Analyses:

Dendraster excentricus

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting Group
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400340

EVS Analysts: KES ART
Test Initiation Date: 30 July 2004

SAMPLE

Identification: G-Creek Sublethal-270704
Amount Received: 5 x 20L
Date Collected: 27 July 2004
Date Received: 30 July 2004
Temperature (°C): 16.0 ① → 15.0
pH: 7.7 ① → 8.1
Dissolved Oxygen (mg/L): 9.6 ① → 8.5
Conductivity (µmhos/cm): 4940
Salinity (ppt): 2.6 ① → 28
Ammonia (mg/L N): –
Chlorine (mg/L Cl): –
Other: –

① Brine adjustment

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab Supplies
Date Received: 30 July 2004
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 30 July 2004
IC50 (and 95% CL): ~~2.2~~ 2.1 (1.9-2.4) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
4.2 ± 4.8 mg/L SDS, CV% = 57

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV Steralized, 0.45µm filtered SW
Temperature (°C): 16.0
pH: 8.0
Dissolved Oxygen (mg/L): 8.2
Salinity (ppt): 28
Other: –

TEST CONDITIONS

Temperature Range (°C): 15.0 – 16.0
pH Range: 8.0 – 8.1
Dissolved Oxygen Range (mg/L): 8.2 – 8.5
Salinity Range (ppt): 28
Sperm:Egg Ratio: 1600:1
Test Duration: 10:10
Other: –

TEST RESULTS

IC 50: 37.3 (24.4 – 46.0) % v/v
IC 25: 8.7 (7.6 – 9.9) % v/v
NOEC: 4.6 % v/v
LOEC: 9.1 % v/v

Data Verified By: [signature]
Date Verified: Sept. 10/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client ~~09-0302-54~~ #kf AZIMUTH CONSULTING GROUP Test Initiation Date/Time 30 JULY 2004

EVS Project No. 09-0302-54 Test Species Dendraster excentricus

EVS Work Order No. 0400340 Source/Date Received #kf 30 JULY 2004 / Westwind Sealab Supplies

Logbook #13 Pages 50 – 53 Test Duration 10:10

Sample ID	Conc/Rep %. v/v	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
CONTROL		16.0	8.0	28	8.2	
BRINE CONTROL		15.0	8.1	28	8.4	
G. CREEK #kf	4.6	15.5	8.0	28	8.2	
↓	9.1	15.5	8.0	28	8.3	
	18.3	15.0	8.0	28	8.3	
	36.6	15.0	8.1	28	8.4	
	73.1	15.0	8.1	28	8.5	
Tech. Init.	kf	kf	kf	kf	kf	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51 Salinity II-A-030303 DO II-A-011202

Data Verified By Qualified Date Verified Sept. 8, 2004

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: AZIMUTH CONSULTING GROUP
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400340
Logbook: Echinoid #13 Pages: 50-53

Test Initiation Date/Time: 30 JULY 2004 @ 16:20
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab Supplies/30 July 2004
Test Duration: 10:10
Sperm:Egg Ratio: 1600:1

Sample ID % (v/v)	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
CONTROL	A	59	41		KEF
	B	62	38		
	C	56	44		
	D	65	35		
4.6	A	60	40		KEF
	B	66	34		
	C	56	44		
	D	58	42		
9.1	A	46	54		KEF
	B	42	58		
	C	45	55		
	D	42	58		
18.3	A	39	61		KEF
	B	36	64		
	C	37	63		
	D	36	64		
36.6	A	31	69		KEF
	B	34	66		
	C	25	75		
	D	31	69		
73.1	A	19	81		KEF
	B	20	80		
	C	21	79		
	D	20	80		

Data Verified By: [signature]
Date Verified: 2/11-8/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: AZIMUTH CONSULTING GROUP
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400340
Logbook: Echinoid #13 Pages: 50-53

Test Initiation Date/Time: 30 JULY 2004 @ 16:20
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab Supplies / 30 July 2004
Test Duration: 10:10
Sperm:Egg Ratio: 1600:1

Sample ID	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
BRINE CONTROL	A	60	40		KG
	B	57	43		↓
	C	59	41		
	D	62	38		↓
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Data Verified By: [signature]
Date Verified: Sept. 8/04

Test: SC-Sperm Cell Fertilization test						Test ID: 0400340	
Species: DE-Dendraster excentricus						Protocol: EPS1/RM/27-EC 92 (Sperm Cell)	
Sample ID: G CREEK 270704E						Sample Type: EFF2-Industrial	
Start Date: 7/30/2004 16:20 (10:16)				End Date: 7/30/2004		Lab ID: BCEVS-EVS Environment Consultants	
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	59	41	
	2	2	D-Control	100	62	38	
	3	3	D-Control	101	56	44	
	4	4	D-Control	100	65	35	
	5	1	B-Control	100	60	40	
	6	2	B-Control	100	57	43	
	7	3	B-Control	100	59	41	
	8	4	B-Control	100	62	38	
	9	1	4.6	100	60	40	
	10	2	4.6	100	66	34	
	11	3	4.6	100	56	44	
	12	4	4.6	100	58	42	
	13	1	9.1	100	46	54	
	14	2	9.1	100	42	58	
	15	3	9.1	100	45	55	
	16	4	9.1	100	42	58	
	17	1	18.3	100	39	61	
	18	2	18.3	100	36	64	
	19	3	18.3	100	37	63	
	20	4	18.3	100	36	64	
	21	1	36.6	100	31	69	
	22	2	36.6	100	34	66	
	23	3	36.6	100	25	75	
	24	4	36.6	100	31	69	
	25	1	73.1	100	19	81	
	26	2	73.1	100	20	80	
	27	3	73.1	100	21	79	
	28	4	73.1	100	20	80	

Comments: Azimuth Consulting Group (Polaris), 09-0302-54 (0400340)

Reviewed by: Qual 8/10/04

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/30/2004 10:10	Test ID:	400340	Sample ID:	G CREEK 270704E
End Date:	7/30/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	EFF2-Industrial
Sample Date:	7/27/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus

Comments: Azimuth Consulting Group (Polaris), 09-0302-54 (0400340)

Conc-%	1	2	3	4
D-Control	0.5900	0.6200	0.5545	0.6500
B-Control	0.6000	0.5700	0.5900	0.6200
4.6	0.6000	0.6600	0.5600	0.5800
9.1	0.4600	0.4200	0.4500	0.4200
18.3	0.3900	0.3600	0.3700	0.3600
36.6	0.3100	0.3400	0.2500	0.3100
73.1	0.1900	0.2000	0.2100	0.2000

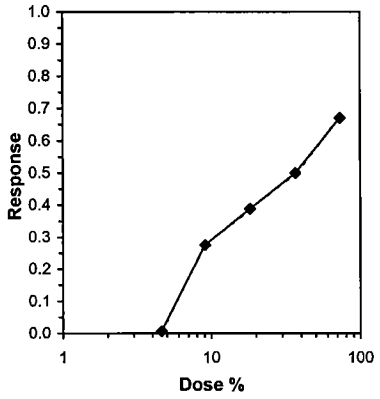
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6036	0.0409	0.6036	0.5545	0.6500	6.778	4				0.6035	1.0000
B-Control	0.5950	0.0208	0.5950	0.5700	0.6200	3.499	4					
4.6	0.6000	0.0432	0.6000	0.5600	0.6600	7.201	4	0.166	2.410	0.0523	0.6000	0.9942
*9.1	0.4375	0.0206	0.4375	0.4200	0.4600	4.712	4	7.650	2.410	0.0523	0.4375	0.7249
*18.3	0.3700	0.0141	0.3700	0.3600	0.3900	3.822	4	10.759	2.410	0.0523	0.3700	0.6131
*36.6	0.3025	0.0377	0.3025	0.2500	0.3400	12.479	4	13.868	2.410	0.0523	0.3025	0.5013
*73.1	0.2000	0.0082	0.2000	0.1900	0.2100	4.082	4	18.589	2.410	0.0523	0.2000	0.3314

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97262	0.884	0.10504	0.3504
Bartlett's Test indicates equal variances (p = 0.12)	8.83506	15.0863		
The control means are not significantly different (p = 0.72)	0.37528	2.44691		

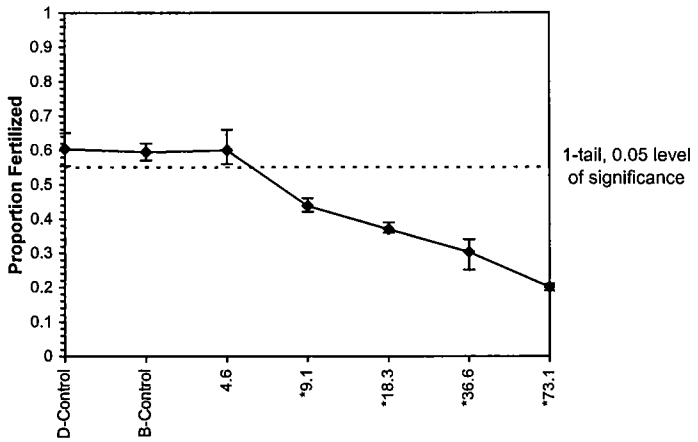
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	4.6	9.1	6.46993	21.7391	0.05233	0.08669	0.1049	0.00094	6.9E-13	5, 18

Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	5.169	1.017	0.000	5.397	-2.0092
IC10	5.883	0.366	4.155	6.252	-1.2685
IC15	6.680	0.367	5.002	7.221	-0.7933
IC20	7.569	0.396	5.813	8.353	-0.2936
IC25	8.561	0.492	6.881	9.883	0.8154
IC40	19.868	2.019	13.185	25.832	0.4117
IC50	36.788	4.538	22.468	46.940	-0.2718



Dose-Response Plot



Statistical comparisons were against the D-control

Reviewed by [signature] 10/04

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/30/2004 10:10	Test ID:	400340	Sample ID:	G CREEK 270704E
End Date:	7/30/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	7/27/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm (	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris), 09-0302-54 (0400340)				

Conc-%	1	2	3	4
D-Control	0.5900	0.6200	0.5545	0.6500
B-Control	0.6000	0.5700	0.5900	0.6200
4.6	0.6000	0.6600	0.5600	0.5800
9.1	0.4600	0.4200	0.4500	0.4200
18.3	0.3900	0.3600	0.3700	0.3600
36.6	0.3100	0.3400	0.2500	0.3100
73.1	0.1900	0.2000	0.2100	0.2000

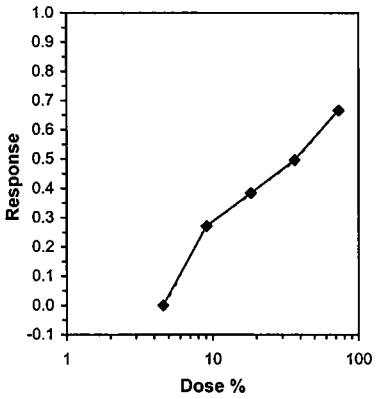
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.5993	0.0304	0.5993	0.5545	0.6500	5.073	8				0.5996	1.0000
4.6	0.6000	0.0432	0.6000	0.5600	0.6600	7.201	4	-0.039	2.508	0.0444	0.5996	1.0000
*9.1	0.4375	0.0206	0.4375	0.4200	0.4600	4.712	4	9.132	2.508	0.0444	0.4375	0.7296
*18.3	0.3700	0.0141	0.3700	0.3600	0.3900	3.822	4	12.941	2.508	0.0444	0.3700	0.6171
*36.6	0.3025	0.0377	0.3025	0.2500	0.3400	12.479	4	16.750	2.508	0.0444	0.3025	0.5045
*73.1	0.2000	0.0082	0.2000	0.1900	0.2100	4.082	4	22.535	2.508	0.0444	0.2000	0.3335

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97514	0.896	0.207	0.38283
Bartlett's Test indicates equal variances (p = 0.14)	8.25726	15.0863		
The control means are not significantly different (p = 0.72)	0.37528	2.44691		

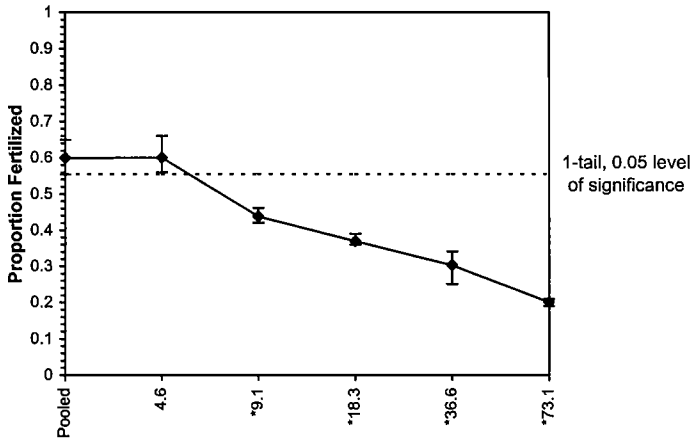
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	4.6	9.1	6.46993	21.7391	0.04445	0.07416	0.12612	0.00084	3.0E-16	5, 22

Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05	5.245	0.437	3.010	5.322	-4.5891	
IC10	5.965	0.211	4.856	6.144	-1.3490	
IC15	6.768	0.218	5.712	7.144	-0.5439	
IC20	7.663	0.265	6.670	8.281	0.2881	
IC25	8.661	0.385	7.566	9.896	1.1053	
IC40	20.352	1.691	14.803	25.784	0.6254	
IC50	37.275	3.916	24.371	46.032	-0.2591	%v/v



Dose-Response Plot



Statistical comparisons were against the pooled controls

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting Group
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400340

EVS Analysts: KES, ART
Test Initiation Date: 30 July 2004

SAMPLE

Identification: SDS RefTox Stock Sol^n #04-5-005
Amount ~~Received~~ Prep'd: 1 x 1L
Date ~~Collected~~ Prep'd: 26 April 2004
Date Received: n/a
Temperature (°C):
pH:
Dissolved Oxygen (mg/L):
Conductivity (µmhos/cm):
Salinity (ppt):
Ammonia (mg/L N):
Chlorine (mg/L Cl):
Other:

TEST SPECIES

Organism: Dendraster excentricus
Source: Westcoast Sealab Supplies
Date Received: 30 July 2004
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 30 July 2004
IC50 (and 95% CL): 2.1 (1.9-2.4) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
4.2 ± 4.8 mg/L SDS, CV% = 57

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV Steralized, 0.45µm filtered SW
Temperature (°C): 16.0
pH: 8.0
Dissolved Oxygen (mg/L): 8.2
Salinity (ppt): 28
Other: —

TEST CONDITIONS

Temperature Range (°C): 16.0
pH Range: 8.0
Dissolved Oxygen Range (mg/L): 8.2
Salinity Range (ppt): 28
Sperm:Egg Ratio: 1600:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC 50: ~~1/2~~ 2.1 (1.9-2.4) mg/L SDS
IC 25: ~~1/3~~ 1.7 (0.9-1.5) mg/L SDS
NOEC: <1 mg/L SDS
LOEC: 1 mg/L SDS

Data Verified By: [signature]
Date Verified: Sept-10/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client: AZIMUTH CONSULTING GROUP
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400340
Logbook: ECHINOID #13 Pages: 50-53

Test Initiation Date/Time: 30 JULY 2004 @16:20
Test Species: Dendraster excentricus
Source/Date Received: 30 JULY
Test Duration: 10:10

Sample ID	Conc/Rep mg/L	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
SDS	CONTROL	16.0	8.0	28	8.2	
	1.0	16.0	8.0	28	~~8.4~~ 8.2	
	1.8	16.0	8.0	28	8.2	
	3.2	16.0	8.0	28	8.2	
	5.6	16.0	8.0	28	8.2	
↓	10.0	16.0	8.0	28	8.2	
Tech. Init.	KEJ	KEJ	KEJ	KEJ	KEJ	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51 Salinity II-A-03-03 DO II-A-011202

Data Verified By: [signature] Date Verified: Sept 8/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNTS (CONTROLS)

Client: AZIMUTH CONSULTING GROUP
EVS Project No.: 09 0302-54
EVS Work Order No.: 0400340
Logbook: ECHINOID #13 Pages: 50 – 53

Test Initiation Date/Time: 30 JULY 2004 @ 16:20
Test Species: Dendraster excentricus
Test Duration: 10:10
Sperm:Egg Ratio: ~~1:1600~~ KEF 1600:1

Concentration SDS mg/L	Replicate	No. Fertilized Eggs	No. Unfertilized Eggs	Comments	Tech. Initials
Reference Toxicant					
1.0	A	47	53		KEF
	B	55	45		↓
	C	50	50		↓
	D	48	52		↓
1.8	A	33	67		KEF
	B	36	64		↓
	C	39	61		↓
	D	35	65		↓
3.2	A	14	86		KEF
	B	11	89		↓
	C	~~KEF 15~~ 15	85		↓
	D	18	82		↓
5.6	A	5	~~KEF 95~~ 95		KEF
	B	8	92		↓
	C	7	93		↓
	D	5	~~482~~ 95		↓
10.0	A	2	98		KEF
	B	3	97		↓
	C	2	98		↓
	D	2	98		↓
Control Seawater					
	A	59	41		KEF
	B	62	38		↓
	C	56	44		↓
	D	65	35		↓

Data Verified By: [signature]
Date Verified: Sept. 10/04

Test: SC-Sperm Cell Fertilization test						Test ID: rtscsds8	
Species: DE-Dendraster excentricus						Protocol: EPS1/RM/27-EC 92 (Sperm Cell)	
Sample ID: REF-Ref Toxicant						Sample Type: SDS-Sodium dodecyl sulfate	
Start Date: 7/30/2003 10:10			End Date: 7/30/2003			Lab ID: BCEVS-EVS Environment Consultants	
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	59	41	
	2	2	D-Control	100	62	38	
	3	3	D-Control	100	56	44	
	4	4	D-Control	100	65	35	
	5	1	1.0	100	47	53	
	6	2	1.0	100	55	45	
	7	3	1.0	100	50	50	
	8	4	1.0	100	48	52	
	9	1	1.8	100	33	67	
	10	2	1.8	100	36	64	
	11	3	1.8	100	39	61	
	12	4	1.8	100	35	65	
	13	1	3.2	100	14	86	
	14	2	3.2	100	11	89	
	15	3	3.2	100	15	85	
	16	4	3.2	100	18	82	
	17	1	5.6	100	5	95	
	18	2	5.6	100	8	92	
	19	3	5.6	100	7	93	
	20	4	5.6	100	5	95	
	21	1	10.0	100	2	98	
	22	2	10.0	100	3	97	
	23	3	10.0	100	2	98	
	24	4	10.0	100	2	98	

Comments: Azimuth Consulting Group 09-0302-54 (0400340)

Reviewed by: Qualified

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/30/2003 10:10	Test ID:	rtscsds8	Sample ID:	REF-Ref Toxicant
End Date:	7/30/2003	Lab ID:	BCEVS-EVS Environment C	Sample Type:	SDS-Sodium dodecyl sulfate
Sample Date:		Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group 09-0302-54 (0400340)				

Conc-mg/L	1	2	3	4
D-Control	0.5900	0.6200	0.5600	0.6500
1	0.4700	0.5500	0.5000	0.4800
1.8	0.3300	0.3600	0.3900	0.3500
3.2	0.1400	0.1100	0.1300	0.1800
5.6	0.0500	0.0800	0.0700	0.0500
10	0.0200	0.0300	0.0200	0.0200

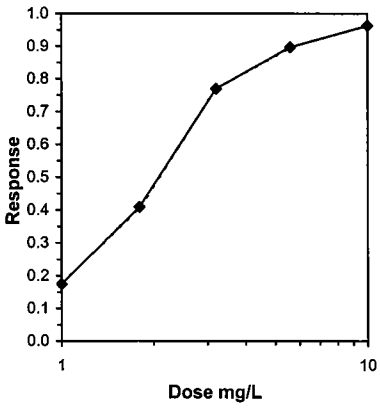
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6050	0.0387	0.6050	0.5600	0.6500	6.402	4				0.6050	1.0000
*1	0.5000	0.0356	0.5000	0.4700	0.5500	7.118	4	5.417	2.410	0.0467	0.5000	0.8264
*1.8	0.3575	0.0250	0.3575	0.3300	0.3900	6.993	4	12.769	2.410	0.0467	0.3575	0.5909
*3.2	0.1400	0.0294	0.1400	0.1100	0.1800	21.028	4	23.990	2.410	0.0467	0.1400	0.2314
*5.6	0.0625	0.0150	0.0625	0.0500	0.0800	24.000	4	27.989	2.410	0.0467	0.0625	0.1033
*10	0.0225	0.0050	0.0225	0.0200	0.0300	22.222	4	30.052	2.410	0.0467	0.0225	0.0372

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95924		0.884		0.47024	-0.048
Bartlett's Test indicates equal variances (p = 0.10)					9.12722		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	<1	1			0.04671	0.07721	0.23459	0.00075	7.9E-17	5, 18

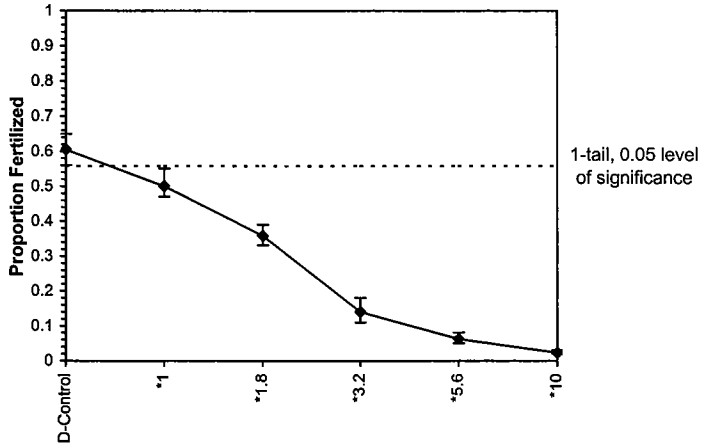
Log-Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	0.2210	0.0598	0.1215	0.4427	1.9998
IC10*	0.4909	0.1376	0.2541	1.0631	1.4199
IC15*	0.8204	0.1664	0.3977	1.2636	0.1322
IC20	1.0770	0.1112	0.6393	1.3408	-0.5478
IC25	1.2308	0.0881	0.9462	1.4744	0.0167
IC40	1.7639	0.0892	1.4812	2.0222	0.0823
IC50	2.1023	0.0768	1.8738	2.3581	0.1963 mg/L SDS

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Reviewed by: Sent. 15/06

APPENDIX C

Chain-of-Custody Form

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

EVS environment consultants
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Client Name: Teck Cominco (Polaris) Client Contact Name: Cheryl. MacKintosh Ship to: _____

Address: Azimuth Consulting Group Phone: 604 730 1220

218-2902 West Broadway Fax: 604 739 8511

Vancouver B.C. Sampled By: Karlette Tinaley Attn: _____ Shipping Date: _____

Topsoil

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested					3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)
For composite sample record date & time starting and ending								Fed Topsoil					
27/07/04	9:30AM	G-Creek_Sublethal_270704	E			2x20L	HDPE						POLARIS Proj
		G-Creek_Acute_270704	E			3x20L	HDPE						POLARIS Proj

PO/Reference No.:

Project Title:

Results Needed By:

Comments/Instructions:

A) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

B) Received by: Ano Date: July 30-04
Company: EVS Time: 1200
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

C) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify) HDPE Plastic
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

Distribution of copies:
White, yellow, pink - accompany the shipment
Orange - retained by consignor (e.g., shipper)
Yellow - retained by consignee (e.g., receiver)
Pink - for use as needed
White - returned to consignor by consignee

Photocopy of original because 3 coolers.

-54

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

EVS environment consultants
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Client Name: Teck Cominco (Polaris) Client Contact Name: Cheryl. MacKintosh Ship to: _____

Address: ~~Azimuth Consulting Group~~ Phone: 604 730 7220

218-2902 West Broadway Fax: 604 739 8511

Vancouver B.C. Sampled By: Karlette Tinsley Attn: _____

Shipping Date: _____ Kathyrn

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested						3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)
For composite sample record date & time starting and ending														
27/07/04	9:30PM	G-Creek_Sublethal_270704	E			2x20L	HDPE							POLARIS PROJ
		G-Creek_Acute_270704	E			3x20L	HDPE							POLARIS PROJ

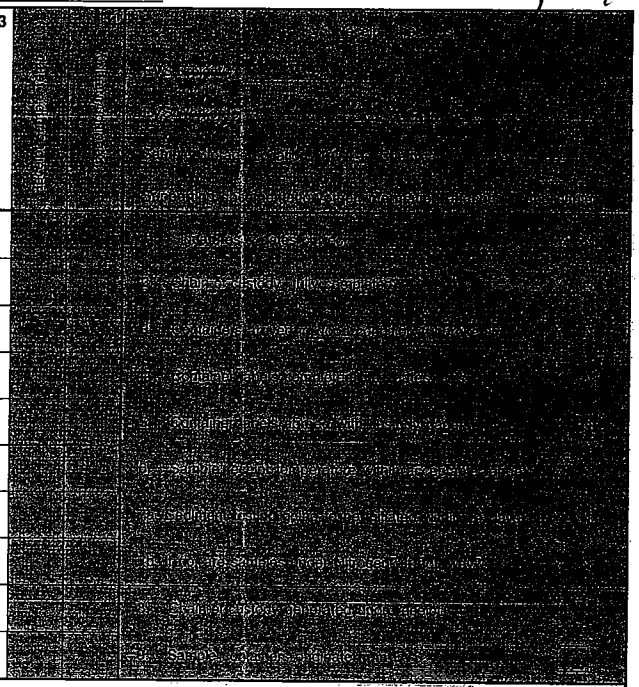


Photo copy of orginal because 3 coolers

PO/Reference No.:

Project Title:

Results Needed By:

Comments/Instructions:

A) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

B) Received by: AWD Date: 30 JULY 2004
Company: EVS Time: 12:00
Shipping containers received secure? (Yes) No
Custody seals intact? (Yes) No ~~N/A~~

C) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify) HDPE Plastic
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

Distribution of copies:
White, yellow, pink - accompany the shipment
Orange - retained by consignor (e.g., shipper)
Yellow - retained by consignee (e.g., receiver)
Pink - for use as needed
White - returned to consignor by consignee

October 2004

LABORATORY REPORT

Azimuth Consulting Group

POLARIS MINE

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

August 24, 2004

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
A Member of the Golder Group of Companies
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

August 24, 2004

LABORATORY REPORT

Prepared for

Azimuth Consulting Group
218-2902 W. Broadway
Vancouver, BC
V6K 2G8

Prepared by

EVS Environment Consultants - A Member of the Golder Group of Companies
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

09-0302-54

October 2004

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Table 4: Summary of results for the Echinoderm (*Dendraster excentricus*) fertilization toxicity test **9**

ACKNOWLEDGEMENTS

The *A. affinis* toxicity test was conducted by Andy Diewald, Anja Fouche and Jenny Shao. Kathryn Sentance and Ann-Marie Norris performed the *D. excentricus* fertilization toxicity test. Statistical analyses were performed by Jenny Shao and Kathryn Sentance. The report was written by Kathryn Sentance and reviewed by Edmund Canaria. Quality Assurance/Quality Control (QA/QC) review was conducted by Julianna Kalokai.

1. INTRODUCTION

EVS Environment Consultants conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as G Creek-082404, was collected from the Polaris Mine Site on August 24, 2004 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on August 27, 2004 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. Toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. The raw data and statistical analyses are provided in Appendix A and B respectively, and the chain-of-custody form is provided in Appendix C.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d toxicity test and reference toxicant test using topsmelt (A. *affinis*) was conducted in accordance with EVS Environment Consultants Standard Operating Procedures (SOP) 1100-5 (EVS, 2004) with modifications based on U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The echinoderm (*Dendraster excentricus*) fertilization toxicity test was conducted in accordance with Environment Canada (1992 with 1997 amendments). Test conditions and methods summarized in Table 2.

This fertilization test involves exposing echinoderm sperm to a series of test concentrations for ten minutes, echinoderm eggs are then added allowing fertilization to occur for ten minutes. Following the ten minutes exposure time the eggs are preserved and the number of fertilized and unfertilized eggs in each replicate are counted. These observations are assessed in comparison to the pooled negative and brine controls.

2.3 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994).

2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general

QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and record-keeping, and use of standard operating procedures (SOPs). To ensure the highest quality of data and reporting, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	10 d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5µm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.4, 9.0, 18.0, 36.0, 71.0% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

Table 2. Echinoderm (*Dendraster excentricus*) fertilization toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static
Test duration	10:10 min
Test chamber	16 X 125 mm test tubes
Test solution volume	10 mL
Number of replicate chambers per treatment	4
Number of eggs per test chamber	2000
Age of test organisms	< 4 hours after spawning
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity adjusted
Control/dilution water	UV-sterilized and 0.5µm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.7, 9.4, 18.8, 37.5, 75.1% (v/v)
Renewal of dilutions	None
Aeration	None during testing
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity
Temperature	15 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Ambient laboratory illumination (moderate intensity)
Reference toxicant	Initiated concurrently with test; same test methods as above using SDS to generate an EC50 value; results compared to lab mean ± 2 SD
Endpoint	Fertilization of eggs
Test validity	≥ 50% and ≤ 100% mean control fertilization
Reference protocols	Environment Canada (1992), (EPS/1/RM/27 with 1997 amendments)

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The test results are summarized in Table 1 and the raw statistical analyses are provided in Appendix A.

The highest concentration tested was approximately 71.0% due to salinity adjustment. The mean survival in both the negative and brine controls was 100%.Mean dry weight in the pooled controls was 0.95mg. The negative and brine controls were not significantly different for the growth and survival endpoints (p =1.00 and p =0.72, respectively).

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival or growth in all tested concentrations relative to the pooled controls ($p \leq 0.05$). For the survival and growth endpoints the NOEC was 71.0, and the LOEC was >71.0% (v/v). The LC50 for survival was >71.0% (v/v). The IC50 and IC25 for growth were both >71.0% (v/v)

3.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The test results are summarized in Table 2 and the raw statistical analyses are provided in Appendix B.

The highest concentration tested was 75.1% due to salinity adjustment. Mean fertilization in the pooled controls was 76.6%. The negative and brine controls were not significantly different (p =0.68).

The *D. excentricus* fertilization toxicity test exhibited adverse effects on egg fertilization in all except the lowest [4.7%(v/v)] test concentrations relative to the pooled controls ($p \leq 0.05$). The NOEC was 4.7 and LOEC was 9.4 %(v/v). The IC50 and IC25 (95% confidence limits) values were 50.7 (48.1 – 53.6) and 17.5 (11.6 – 22.6) %(v/v), respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

Table 3. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% v/v)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
D-Control	100.0 ± 0.0	0.93 ± 0.06
Brine Control	100.0 ± 0.0	0.96 ± 0.18
Pooled Controls	100.0 ± 0.0	0.95 ± 0.13
4.4	100.0 ± 0.0	1.06 ± 0.26
9.0	100.0 ± 0.0	0.87 ± 0.06
18.0	100.0 ± 0.0	0.97 ± 0.17
36.0	96.0 ± 8.9	0.92 ± 0.13
71.0	100.0 ± 0.0	0.87 ± 0.16
TEST ENDPOINT	**SURVIVAL (% v/v)**	**GROWTH (% v/v)**
NOEC	71.0	71.0
LOEC	>71.0	>71.0
LC50	>71.0	na
IC50	na	>71.0
IC25	na	>71.0

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; na – not applicable.

Table 4. Summary of results for the Echinoderm (*Dendraster excentricus*) fertilization toxicity test

TEST CONCENTRATION (% v/v)	PROPORTION FERTILIZED (%) (MEAN ± SD)
Negative Control	77.0 ± 2.4
Brine Control	76.2 ± 2.5
Pooled Control	76.6 ± 2.3
4.7	75.0 ± 2.6
9.4	61.2 ± 1.0*
18.8	57.0 ± 1.8*
37.5	49.2 ± 1.0*
75.1	25.8 ± 1.5*
TEST ENDPOINT	**PROPORTION FERTILIZED %(v/v)**
NOEC	4.7
LOEC	9.4
IC50 (95% CL)	50.7 (48.1 – 53.6)
IC25 (95% CL)	17.5 (11.6 – 22.6)

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; CL – Confidence Limits.

4. REFERENCES

Environment Canada. 1992. Biological test method: fertilization of echinoids (sea urchins and sand dollars). Environmental Protection Series, Report EPS 1/RM/27, December 1992. Environment Canada, Conservation and Protection, Ottawa, ON. 68 pp + appendices. Amended November 1997.

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APPENDIX A

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client: Azimuth (Polaris) | EVS Analysts: AWD, JKS
EVS Project No.: 09-5302-54
EVS Work Order No.: 0400384 | Test Initiation Date: Aug 25, 2004

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	G-Creek 082404	→	→
Amount Received	1 x 20L	→	→
Date Collected	24-Aug-04	→	→
Date Received	27-Aug-04	→	→
Temperature (°C)	20.0 B 20.0	20.0 D 20.0	20.0 D 20.0
pH	7.6 D 8.1	7.6 D 8.2	7.5 D 8.3
DO (mg/L)	10.1 D 7.4	10.0 D 7.5	11.0 D 7.5
Conductivity (µmhos/cm)	9230	—	—
Salinity (ppt)	5.2 D 28	5.1 D 28	5.2 D 28
Ammonia (mg/L N)			
Chlorine (mg/L Cl)			
Other	D Salinity adj. to 30±2 ppt w/ 90ppt HSB		

DILUTION/CONTROL WATER (initial water quality)
Water Type: UV Sterilized S.W.
Temperature (°C): 20.0
pH: 7.8
Dissolved Oxygen (mg/L): 7.4
Salinity: 28

TEST SPECIES INFORMATION
Source: ABS (Aquatic Bio Systems)
Date Received: Aug 26 2004
Age (on Day 0): 10-d
Reference Toxicant: Copper
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date: Aug 25, 2004
7-d survival LC50: 121 (107-137) ug/L
7-d growth IC50: 128 (85-152) (41-153) ug/L
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50: 132 ± 48 ug/L CV: 18%
7-d growth IC50: 138 ± 51 ug/L CV: 20%

TEST CONDITIONS
Temperature Range (°C): 20.0 - 21.0
pH Range: 7.8 - 8.3
Dissolved Oxygen Range (mg/L): 6.4 - 7.6
Salinity (ppt): 28
Photoperiod (L:D h): 16:8
Aeration Provided?: No
Other: —

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	% (v/v)	71	>71	>71		
Growth		71	>71		>71	>71

Other:

Data Verified By: [signature] | Date Verified: Oct-27/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris) | Sample ID: G-Creek @ 082404

EVS Project No.: 09-0302-54 | Test Initiation Date/Time: Aug 25, 2004 @ 1230 L

EVS Work Order No.: 0400384 | Source/Date Received: ABS / Aug 26, 2004

Concentration % (v/v)	Temperature (°C)													
	0	1 old	1 new	2		3		4		5		6		7
Control	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.5	20.0	20.0	20.5
Brine Control	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.5	20.0	20.5	20.0
4.4	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.5	20.0	20.5	20.5
9.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.5	20.0	20.5	20.5
18	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.5	20.0	20.5	20.5
36	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.5	20.0	20.5	20.5
71	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	21.0	20.0	20.6	20.0	20.0	20.5
Tech. Initials	~	~	~	~	~	~	~	JW	JW	~	~	JW	JW	JW

Concentration % (v/v)	pH													
	0	1		2		3		4		5		6		7
Control	7.8	8.0	8.0	8.1	7.9	8.0	7.9	8.0	7.9	7.9	7.9	7.9	7.9	7.9
Brine Control	7.8	8.0	8.0	8.1	7.9	8.0	7.9	8.0	7.9	7.9	7.9	7.9	7.9	7.9
4.4	7.7	8.1	8.1	8.1	8.1	8.0	8.1	8.0	8.1	8.0	8.1	7.9	7.9	8.0
9.0	7.8	8.3	8.1	8.2	8.1	8.0	8.2	8.0	8.1	8.1	8.1	8.0	7.9	8.0
18	7.8	8.2	8.1	8.2	8.2	8.0	8.2	8.0	8.1	8.1	8.1	8.0	8.0	8.1
36	7.9	8.3	8.2	8.2	8.2	8.0	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1
71	8.1	8.3	8.3	8.3	8.2	8.0	8.3	8.2	8.3	8.2	8.2	8.2	8.1	8.1
Tech. Initials	~	~	~		~	~	~	JW	JW	A	~	JW	JW	JW

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH H-A-52

Comments

Test Set Up By: AWN | Data Verified By: [signature] | Date Verified: Oct 20/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris) | Sample ID: G-Creek 082404

EVS Project No.: 09-0302-54 | Test Initiation Date/Time: Aug 25th 2004 @ 1230h

EVS Work Order No.: 0400384 | Source/Date Received: ABS / Aug 26th 2004

Concentration %o (v/v)	Salinity (ppt)							
	0	1	2	3	4	5	6	7
Control	28	28	28	28	28	28	28	28
Brine Control	28	28	28	28	28	28	28	28
4.4	28	28	28	28	28	28	28	28
9.0	28	28	28	28	28	28	28	28
18	28	28	28	28	28	28	28	28
36	28	28	28	28	28	28	28	28
71	28	28	28	28	28	28	28	28
Tech. Initials	~	~	~	~	AWS	JWS	JWS	AS

Concentration %o (v/v)	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
Control	7.4	6.5	7.5	6.9	7.5	7.0	7.5	7.0	7.5	6.4	7.4	7.6	6.5	6.6
Brine Control	7.4	6.6	7.5	6.8	7.5	6.9	7.5	6.9	7.5	6.6	7.4	7.5	6.4	6.4
4.4	7.4	6.7	7.5	6.7	7.5	6.9	7.5	6.9	7.5	6.7	7.5	7.6	6.6	6.5
9.0	7.4	6.6	7.5	6.8	7.5	6.9	7.5	7.0	7.5	6.8	7.5	7.6	6.6	6.5
18	7.4	6.4	7.5	6.8	7.5	6.9	7.5	6.9	7.5	6.8	7.6	7.5	6.7	6.5
36	7.4	6.5	7.6	6.9	7.5	6.9	7.5	6.9	7.5	6.8	7.5	7.5	6.8	6.4
71	7.4	6.5	7.6	6.8	7.5	6.9	7.5	6.9	7.5	6.7	7.4	7.5	6.7	6.5
Tech. Initials	~	~	~	~	~	~	AWS	JWS	AWS	~	~	JWS	JWS	~

WQ Instruments Used: Salinity II-A-030304 DO II-A-3

Comments

Test Set Up By: AWS | Data Verified By: [signature] | Date Verified: Oct-20/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris) | Sample ID: G-Creek 082404
EVS Project No.: 09-0302-54 | Test Species/Batch: A. affinis / Aug 17-04
EVS Work Order No.: 0400384 | Test Initiation Date/Time: Aug 25, 2004 @ 1230h
No. of Organisms/Volume: 5/200mL

% (v/v) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
Control	A	A 31	5	5	5	5	5	5	5	
	B	32	5	5	5	5	5	5	5	
	C	33	5	5	5	5	5	5	5	
	D	34	5	5	5	5	5	5	5	
	E	35	5	5	5	5	5	5	5	
Brine	A	36	5	5	5	5	5	5	5	
	B	37	5	5	5	5	5	5	5	
	C	38	5	5	5	5	5	5	5	
	D	39	5	5	5	5	5	5	5	
	E	40	5	5	5	5	5	5	5	
4.4	A	41	5	5	5	5	5	5	5	
	B	42	5	5	5	5	5	5	5	
	C	43	5	5	5	5	5	5	5	
	D	44	5	5	5	5	5	5	5	
	E	45	5	5	5	5	5	5	5	
9.0	A	546	5	5	5	5	5	5	5	
	B	547	5	5	5	5	5	5	5	
	C	548	5	5	5	5	5	5	5	
	D	549	5	5	5	5	5	5	5	
	E	680	5	5	5	5	5	5	5	
Technician Initials		JvS	~	~	JvS	~	~	JvS	JvS	

Sample Description: clear, colorless
Data Verified By: Galphy | Date Verified: Oct 20/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400384

Sample ID: G. Creek 082404
Test Species/Batch: A. affinis / Aug 9-04
Test Initiation Date/Time: Aug 25, 2004 @ 1230h
No. of Organisms/Volume: 5/200mL

% (v/v) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
18	A	46	5	5	5	5	5	5	5	
	B	47	5	5	5	5	5	5	5	
	C	48	5	5	5	5	5	5	5	
	D	49	5	5	5	5	5	5	5	
	E	50	5	5	5	5	5	5	5	
36	A	51	5	5	5	5	5	5	5	
	B	52	5	5	5	5	5	5	5	
	C	53	5	5	5	5	5	5	4	
	D	54	5	5	5	5	5	5	5	
	E	55	5	5	5	5	5	5	5	
71	A	61	5	5	5	5	5	5	5	
	B	62	5	5	5	5	5	5	5	
	C	63	5	5	5	5	5	5	5	
	D	64	5	5	5	5	5	5	5	
	E	65	5	5	5	5	5	5	5	
	A	6								
	B	7								
	C	8								
	D	9								
	E	10								
Technician Initials		JCS	M	—	JCS	C	~	JCS	JCS	

Sample Description: clear, colorless
Data Verified By: Ralph K
Date Verified: Oct 20/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400384

Start Date (Day 0): August 25, 2004
Sample ID: G-Creek 082404
Balance Type/Serial Number: Sartorius BP211D

Sample ID % (v/v)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
Control	A	A31	1228.40	1233.24	5	5	pre-WT: 1228.42 mg	
	B	32	1229.96	1234.81	5	5		
	C	33	1231.09	1235.98	5	5		
	D	34	1226.23	1230.46	5	5	reweighed 1230.49 mg ✓	
	E	35	1218.59	1223.06	5	5		
Brine control	A	36	1226.59	1231.11	5	5		
	B	37	1234.73	1239.03	5	5		
	C	38	1220.42	1226.76	5	5		
	D	39	1232.69	1237.55	5	5		
	E	40	1236.53	1240.57	5	5		
4.4%	A	41	1227.94	1232.63	5	5		
	B	42	1224.25	1231.84	5	5		
	C	43	1235.61	1240.72	5	5	reweighed 1240.68 mg ✓	
	D	44	1219.66	1223.97	5	5		
	E	45	1225.29	1230.00	5	5	pre-WT: 1225.29 mg	

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: Oct. 20/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400384

Start Date (Day 0): August 25, 2004
Sample ID: G-Creek 082404
Balance Type/Serial Number: Sartorius BP 211D

Sample ID % (J/J)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
18	A	A 46	12.17.86	1222.46	5	5		
	B	47	1225.29	1228.77	5	5		
	C	48	1236.54	1242.18	5	5		
	D	49	1239.09	1244.52	5	5		
	E	50	1241.45	1246.42	5	5	reweighed: 1246.43 mg ✓	
36	A	51	1227.42	1230.87	5	5		
	B	52	1224.43	1228.50	5	5		
	C	53	1239.89	1243.83	4	4		
	D	54	1231.71	1236.86	5	5		
	E	55	1236.12	1240.57	5	5		
8.8	A	56	1233.41	1237.89	5	5		
	B	57	1232.69	1236.99	5	5		
	C	58	1218.75	1223.49	5	5		
	D	59	1238.08	1237.03	5	5		
	E	60	1222.96	1227.12	5	5	prewt: 1222.96 mg	

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph K

Date Verified: Oct 20/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
Start Date (Day 0): August 25, 2004
EVS Project No.: 09-0302-54
Sample ID: G-Creek 082404
EVS Work Order No.: 0400384
Balance Type/Serial Number: Sartorius BP211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
0% (4/5)								
72 71	A	A 61	1236.40	1239.74	5	5		~~TD~~
	B	62	1236.44	1240.25	5	5		
	C	63	1219.08 ~~1223.84~~	1224.54	5	5	reweighed 1224.57 mg	
	D	64	1228.47	1233.11	5	5		
	E	65	1243.42	1247.95	5	5	pre-wt: 1243.44 mg	
	A	6						
	B	7						
	C	8						
	D	9						
	E	0						
	A	1						
	B	2						
	C	3						
	D	4						
	E	5						

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph Ty
Date Verified: Oct 20/04

Test: LF-Larval Fish Growth and Survival Test
Test ID: 0400384
Species: AA-Atherinops affinis
Protocol: EPAW 95-EPA West Coast
Sample ID: G_CREEK
Sample Type: EFF2-Industrial
Start Date: 8/27/2004 End Date: 9/3/2004
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1233.24	1228.4
	2	2	D-Control	5							5	5	1234.81	1229.96
	3	3	D-Control	5							5	5	1235.98	1231.09
	4	4	D-Control	5							5	5	1230.46	1226.23
	5	5	D-Control	5							5	5	1223.06	1218.59
	6	1	Brine Control	5							5	5	1231.11	1226.59
	7	2	Brine Control	5							5	5	1239.03	1234.73
	8	3	Brine Control	5							5	5	1226.76	1220.42
	9	4	Brine Control	5							5	5	1237.55	1232.69
	10	5	Brine Control	5							5	5	1240.57	1236.53
	11	1	4.400	5							5	5	1232.63	1227.94
	12	2	4.400	5							5	5	1231.84	1224.25
	13	3	4.400	5							5	5	1240.72	1235.61
	14	4	4.400	5							5	5	1223.97	1219.66
	15	5	4.400	5							5	5	1230	1225.29
	16	1	9.000	5							5	5	1237.89	1233.41
	17	2	9.000	5							5	5	1236.99	1232.69
	18	3	9.000	5							5	5	1223.49	1218.75
	19	4	9.000	5							5	5	1237.03	1233.08
	20	5	9.000	5							5	5	1227.12	1222.96
	21	1	18.000	5							5	5	1222.48	1217.86
	22	2	18.000	5							5	5	1228.77	1225.29
	23	3	18.000	5							5	5	1242.18	1236.54
	24	4	18.000	5							5	5	1244.52	1239.09
	25	5	18.000	5							5	5	1246.42	1241.45
	26	1	36.000	5							5	5	1230.87	1225.42
	27	2	36.000	5							5	5	1228.5	1224.43
	28	3	36.000	5							4	4	1243.83	1239.89
	29	4	36.000	5							5	5	1236.86	1231.71
	30	5	36.000	5							5	5	1240.57	1236.12
	31	1	71.000	5							5	5	1239.74	1236.4
	32	2	71.000	5							5	5	1240.25	1236.44
	33	3	71.000	5							5	5	1224.54	1219.08
	34	4	71.000	5							5	5	1233.11	1228.47
	35	5	71.000	5							5	5	1247.95	1243.42

Comments: Azimuth - Polaris Mine; G-Creek, 09-0302-54 ;0400384

Reviewed by: Oct 17/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/27/2004	Test ID: 400384	Sample ID: G_CREEK-082404
End Date:	9/3/2004	Lab ID: BCEVS-EVS Environment Cc	Sample Type: EFF2-Industrial
Sample Date:	8/24/2004	Protocol: EPAW 95-EPA West Coast	Test Species: AA-Atherinops affinis
Comments:	Azimuth - Polaris Mine; G-Creek, 09-0302-54 ;0400384		

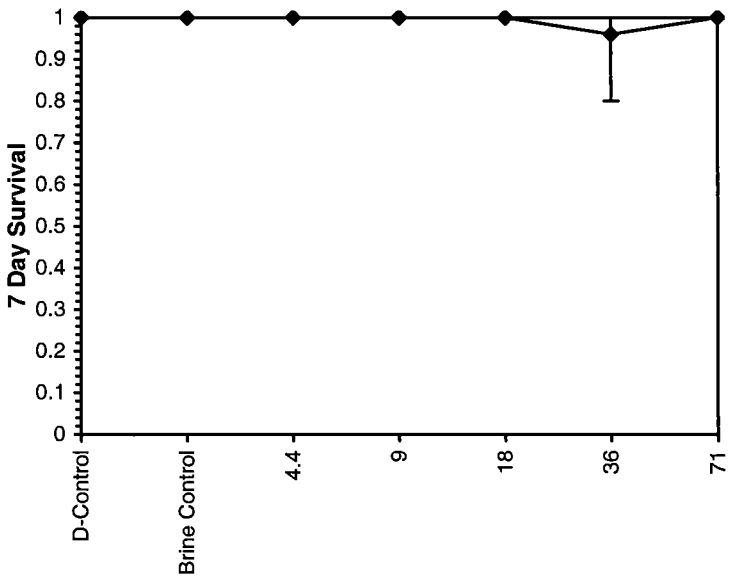
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
Brine Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.4	1.0000	1.0000	1.0000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	1.0000
18	1.0000	1.0000	1.0000	1.0000	1.0000
36	1.0000	1.0000	0.8000	1.0000	1.0000
71	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
Brine Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
4.4	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
9	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
18	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
36	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
71	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.41613	0.9	-3.8705	19.8512
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	71	>71		1.40845

Dose-Response Plot



Statistical comparison were against the D-control.

Reviewed by: Oct-20/04

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/27/2004	Test ID:	400384	Sample ID:	G_CREEK-082404
End Date:	9/3/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	8/24/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris Mine; G-Creek, 09-0302-54 ;0400384				

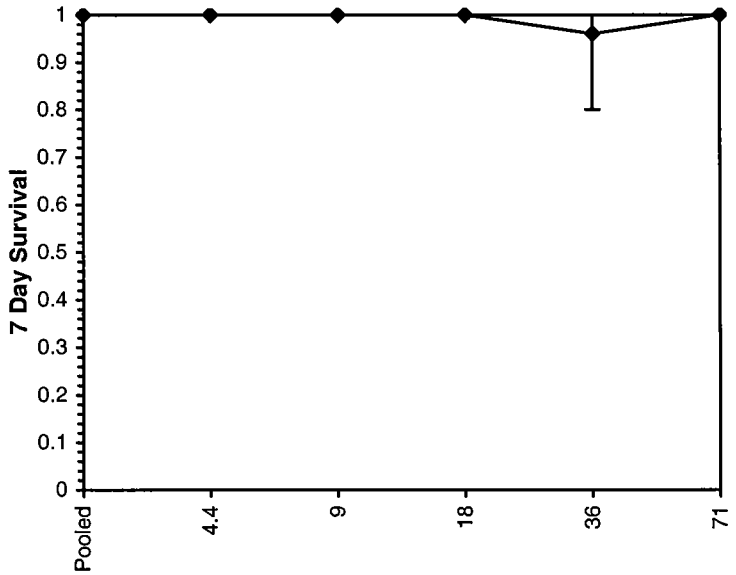
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
Brine Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.4	1.0000	1.0000	1.0000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	1.0000
18	1.0000	1.0000	1.0000	1.0000	1.0000
36	1.0000	1.0000	0.8000	1.0000	1.0000
71	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Pooled	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	10		
4.4	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
9	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
18	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
36	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
71	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.38831	0.91	-4.1486	23.0852
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	71	>71		1.40845

Dose-Response Plot



Statistical comparison were against the pooled control.

Reviewed by: Oct 20/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/27/2004	Test ID:	400384	Sample ID:	G_CREEK-082404
End Date:	9/3/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	EFF2-Industrial
Sample Date:	8/24/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis

Comments: Azimuth - Polaris Mine; G-Creek, 09-0302-54 ;0400384

Conc-%	1	2	3	4	5
D-Control	0.9680	0.9700	0.9780	0.8460	0.8940
Brine Control	0.9040	0.8600	1.2680	0.9720	0.8080
4.4	0.9380	1.5180	1.0220	0.8620	0.9420
9	0.8960	0.8600	0.9480	0.7900	0.8320
18	0.9240	0.6960	1.1280	1.0860	0.9940
36	1.0900	0.8140	0.7880	1.0300	0.8900
71	0.6680	0.7620	1.0920	0.9280	0.9060

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9312	0.0585	0.9312	0.8460	0.9780	6.283	5				0.9938	1.0000
Brine Control	0.9624	0.1811	0.9624	0.8080	1.2680	18.820	5					
4.4	1.0564	0.2642	1.0564	0.8620	1.5180	25.007	5	-1.252	2.360	0.2361	0.9938	1.0000
9	0.8652	0.0604	0.8652	0.7900	0.9480	6.980	5	0.660	2.360	0.2361	0.9177	0.9235
18	0.9656	0.1704	0.9656	0.6960	1.1280	17.643	5	-0.344	2.360	0.2361	0.9177	0.9235
36	0.9224	0.1328	0.9224	0.7880	1.0900	14.396	5	0.088	2.360	0.2361	0.9177	0.9235
71	0.8712	0.1631	0.8712	0.6680	1.0920	18.721	5	0.600	2.360	0.2361	0.8712	0.8766

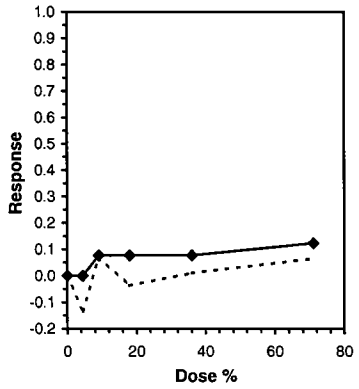
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94863	0.9	0.95961	2.51611
Bartlett's Test indicates equal variances (p = 0.05)	11.0427	15.0863		
The control means are not significantly different (p = 0.72)	0.36654	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	71	>71		1.40845	0.23609	0.25353	0.02479	0.02502	0.44403	5, 24

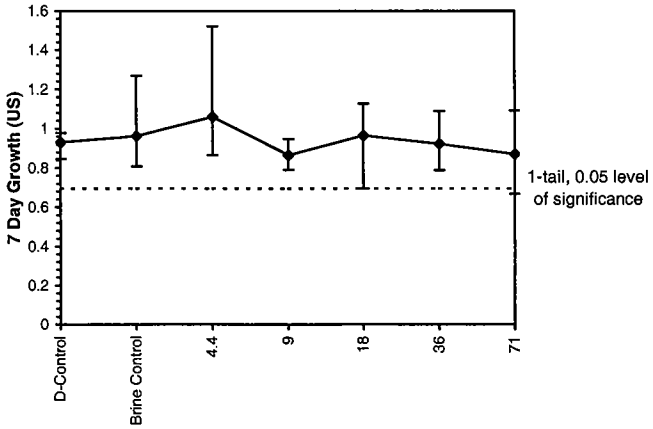
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	7.405			
IC10	53.535			
IC15	>71			
IC20	>71			
IC25	>71			
IC40	>71			
IC50	>71			

% (v/v)



Dose-Response Plot



Statistical comparison were against the D-control.

Reviewed by: Oct-20/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/27/2004	Test ID:	400384	Sample ID:	G_CREEK-082404
End Date:	9/3/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	8/24/2004	Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis

Comments: Azimuth - Polaris Mine; G-Creek, 09-0302-54 ;0400384

Conc-%	1	2	3	4	5
D-Control	0.9680	0.9700	0.9780	0.8460	0.8940
Brine Control	0.9040	0.8600	1.2680	0.9720	0.8080
4.4	0.9380	1.5180	1.0220	0.8620	0.9420
9	0.8960	0.8600	0.9480	0.7900	0.8320
18	0.9240	0.6960	1.1280	1.0860	0.9940
36	1.0900	0.8140	0.7880	1.0300	0.8900
71	0.6680	0.7620	1.0920	0.9280	0.9060

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.9468	0.1280	0.9468	0.8080	1.2680	13.514	10				1.0016	1.0000
4.4	1.0564	0.2642	1.0564	0.8620	1.5180	25.007	5	-1.258	2.462	0.2146	1.0016	1.0000
9	0.8652	0.0604	0.8652	0.7900	0.9480	6.980	5	0.936	2.462	0.2146	0.9177	0.9163
18	0.9656	0.1704	0.9656	0.6960	1.1280	17.643	5	-0.216	2.462	0.2146	0.9177	0.9163
36	0.9224	0.1328	0.9224	0.7880	1.0900	14.396	5	0.280	2.462	0.2146	0.9177	0.9163
71	0.8712	0.1631	0.8712	0.6680	1.0920	18.721	5	0.868	2.462	0.2146	0.8712	0.8698

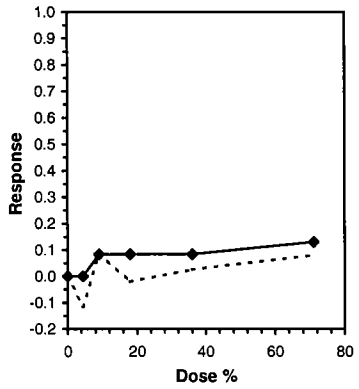
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94174	0.91	1.04686	2.00659
Bartlett's Test indicates equal variances (p = 0.18)	7.64107	15.0863		
The control means are not significantly different (p = 0.72)	0.36654	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	71	>71		1.40845	0.21455	0.22661	0.02493	0.02531	0.44385	5, 29

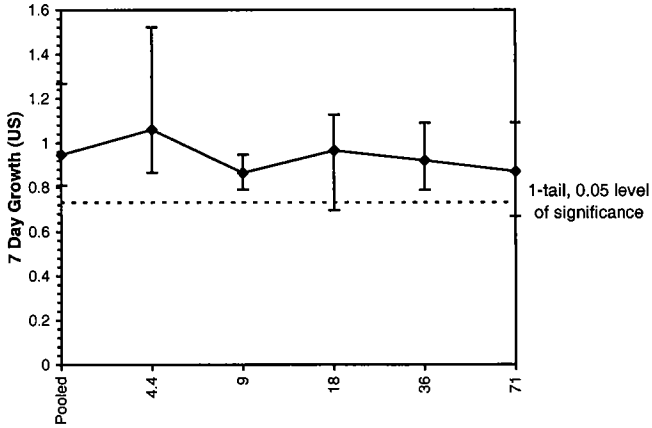
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	7.147			
IC10	48.255			
IC15	>71			
IC20	>71			
IC25	>71			
IC40	>71			
IC50	>71			

% (v/v)



Dose-Response Plot



Statistical comparison were against the pooled control.

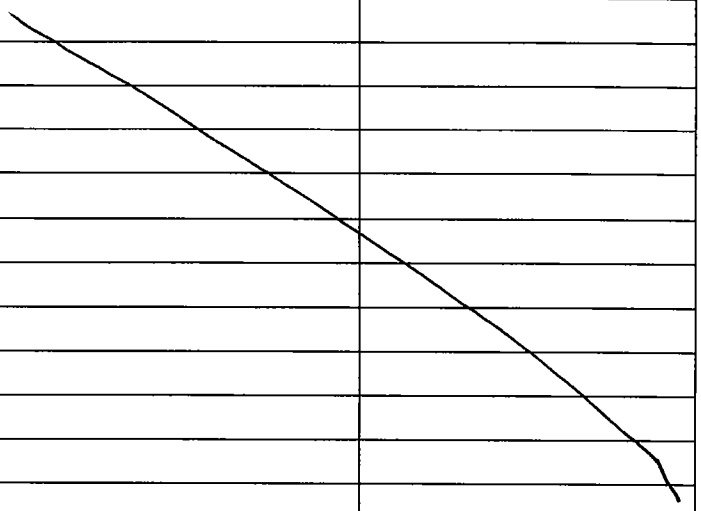
Reviewed by Oct 20/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth (Polaris)
EVS Project No. 09-0302-54
EVS Work Order No. 0400384

EVS Analysts AWD. JxS. AxF
Test Initiation Date Aug 27, 2004

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	04-Cu-001		
Amount Received	1 x 1 L		
Date Collected	15-March-04		
Date Received			
Temperature (°C)			
pH			
DO (mg/L)			
Conductivity (µmhos/cm)			
Salinity (ppt)			
Ammonia (mg/L N)			
Chlorine (mg/L Cl)			
Other			



DILUTION/CONTROL WATER (initial water quality)
Water Type Filtered, UV sterilized S.W.
Temperature (°C) 20.0
pH 7.8
Dissolved Oxygen (mg/L) 7.4
Salinity 28

TEST SPECIES INFORMATION
Source ABS (Aquatic Biosystems)
Date Received Aug 26, 2004
Age (on Day 0) 10-d
Reference Toxicant Copper
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date Aug 27, 2004
7-d survival LC50 121 (107-137) mg/L Cu
7-d growth IC50 128 (85-150) mg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 132 ± 48 mg/L CV: 18%
7-d growth IC50 131 ± 52 mg/L CV: 20%

TEST CONDITIONS
Temperature Range (°C) 20.0 - 21.0
pH Range 7.8 - 8.2
Dissolved Oxygen Range (mg/L) 6.4 - 7.7
Salinity (ppt) 28
Photoperiod (L:D h) 16:8
Aeration Provided? No
Other -

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	mg/L	100	180	121 (107-137)		
Growth		56	100		128 (85-150)	93 (53-124)

Other

Data Verified By [signature] Date Verified Oct. 27/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris) | Sample ID: Cu Ref/tox
EVS Project No.: 09-0302-54 | Test Initiation Date/Time: Aug 25, 2004 / 1245 (26th)
EVS Work Order No.: 0400384 | Source/Date Received: ABS / Aug 18, 2004

Concentration µg/L	Temperature (°C)													
	0	1		2		3		4		5		6		7
Control	20.0	20.5	20.0	20.5	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0	20.5
32.0	20.0	20.5	20.0	20.5	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0	20.5
56.0	20.0	20.5	20.0	20.5	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0	20.5
100.0	20.0	20.5	20.0	20.5	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0	20.5
180.0	20.0	20.5	20.0	20.5	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0	20.5
320.0	20.0	20.5	20.0	20.5	20.0	20.0	20.5	—						
Tech. Initials														

Concentration µg/L	pH													
	0	1		2		3		4		5		6		7
Control	7.8	8.0	8.0	8.0	7.9	8.0	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
32.0	7.8	8.0	8.0	8.0	7.9	8.0	7.9	8.0	7.9	7.9	7.8	7.9	7.8	7.8
56.0	7.8	8.1	8.0	7.9	7.9	8.0	7.9	8.0	7.9	7.9	7.9	7.9	7.8	7.8
100.0	7.8	8.1	8.0	8.1	7.9	8.0	7.9	8.0	7.9	8.0	7.9	7.9	7.8	7.9
180.0	7.8	8.1	8.0	8.0	7.9	8.0	7.9	8.0	7.9	7.9	7.9	7.9	7.9	7.9
320.0	7.8	8.0	8.0	8.0	7.9	8.0	7.9	—						
Tech. Initials														

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH II-A-52
Comments

Test Set Up By: AWD | Data Verified By: [signature] | Date Verified: Oct. 20/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client: Azimuth (Polaris) | Sample ID: Cu Ref Tox

EVS Project No.: 09-0302-54 | Test Initiation Date/Time: Aug 27, 2004 @ 1245

EVS Work Order No.: 0400384 | Source/Date Received: ABS / Aug 26, 2004

Concentration µg/L	Salinity (ppt)							
	0	1	2	3	4	5	6	7
control	28	28	28	28	28	28	28	28
32.0	28	28	28	28	28	28	28	28
56.0	28	28	28	28	28	28	28	28
100.0	28	28	28	28	28	28	28	28
180.0	28	28	28	28	28	28	28	28
320.0	28	28	28	28	28	~~28~~	—	—
Tech. Initials	^	^	^	JAS	^	^	JAS	JAS

Concentration µg/L	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
control	7.4	6.7	7.5	6.6	7.5	6.9	7.5	7.0	7.7	6.7	7.4	7.6	6.7	6.6
32.0	7.4	6.4	7.5	6.7	7.5	6.9	7.5	6.9	7.5	6.6	7.4	7.6	6.8	6.7
56.0	7.4	6.5	7.5	6.6	7.5	6.9	7.5	7.0	7.5	6.6	7.4	7.6	6.9	6.8
100.0	7.4	6.5	7.5	6.7	7.5	7.0	7.5	7.1	7.5	6.7	7.4	7.6	6.7	6.7
180.0	7.4	6.6	7.5	6.7	7.5	7.0	7.5	7.0	7.5	6.4	7.4	7.7	6.7	6.7
320.0	7.4	6.6	7.5	6.7	7.5	7.1	7.5	7.0	7.5	—				
Tech. Initials	^	^	^	^	^	JAS	^	^	^	^	^	JAS	JAS	JAS

WQ Instruments Used: Salinity II-A-030304 DO II-A-3

Comments

Test Set Up By: AWD | Data Verified By: Qualified | Date Verified: Oct-20/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400384

Sample ID: Cu Reftox
Test Species/Batch: A. affinis / Aug 17-04
Test Initiation Date/Time: Aug 25, 2004 @ 1245 L
No. of Organisms/Volume: 5/200mL

Concentration 49/L	Rep.	Pan No.	Number of Survivors – Day of Test 1	2	3	4	5	6	7	Comments
Control	A	A 1	5	5	5	5	5	5	5	
	B	2	5	5	5	5	5	5	5	
	C	3	5	5	5	5	5	5	5	
	D	4	5	5	5	5	5	5	5	
	E	5	5	5	5	5	5	5	5	
320	A	6	5	5	5	5	5	4	4	
	B	7	5	5	5	5	5	5	5	
	C	8	5	5	5	5	5	5	5	
	D	9	5	5	5	5	5	5	5	
	E	0	5	5	5	5	5	5	5	
560	A	11	5	5	5	5	5	5	5	
	B	12	5	5	5	5	5	5	5	
	C	13	5	5	5	5	5	5	5	
	D	14	5	5	5	5	5	5	5	
	E	15	5	5	5	5	5	5	5	
1000	A	16	4	4	4	4	4	4	4	
	B	17	5	5	5	5	5	5	5	
	C	18	5	5	5	5	5	5	5	
	D	19	4	2	2	2	2	2	2	
	E	20	4	4	4	4	4	3	3	
Technician Initials		JWS	~	~	JWS	~	~	AXF/JWS	JWS	

Sample Description: clear, colorless
Data Verified By: Ralph K
Date Verified: Oct-27/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400384

Sample ID: Cu reftox
Test Species/Batch: A. affinis / Aug 24-04
Test Initiation Date/Time: Aug 25, 2004 @ 1245
No. of Organisms/Volume: 5/200mL

Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
49/L	A	A21	2	2	2	2	2	2	2	
	B	22	2	0	0	~				
1800	C	23	5	3	3	3	3	2	0	
	D	24	1	1	1	1	1	0		
	E	25	2	1	1	0	~			
	A	26	0	~						
	B	27	0							
3200	C	28	2	2	~					
	D	29	15	1	~					
	E	30	0	~						
	A	1								
	B	2								
	C	3								
	D	4								
	E	5								
	A	6								
	B	7								
	C	8								
	D	9								
	E	0								
Technician Initials		JWS	~	~	JWS	~	~	AMP/SKS	JWS	

Sample Description: clear, colorless
Data Verified By: Galyik
Date Verified: Oct. 27/04

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 09-0302-54
EVS Work Order No.: 0400384

Start Date (Day 0): August 27, 2004
Sample ID: Cu Reftox
Balance Type/Serial Number: Sartorius BP211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
791L								AW/SA
Control	A	A 1	1236.92	1240.48	5	5		
	B	2	1234.84	1239.67	5	5		
	C	3	1233.83	1238.43	5	5		
	D	4	1234.81	1239.99	5	5	pre-wt: 1234.82 reweighed: 1240.01 mg ✓	
	E	5	1236.88 1236.85	1241.27	5	5		
320	A	6	1236.55	1239.45	4	4		
	B	7	1223.58	1227.87	5	5		
	C	8	1228.35	1233.01	5	5		
	D	9	1236.84	1240.60	5	5	reweighed: 1240.62 mg ✓	
	E	10	1230.58	1235.34	5	5		
560	A	11	1240.99	1244.89	5	5		
	B	12	1240.22	1243.80	5	5		
	C	13	1232.03	1236.09	5	5		
	D	14	1222.70	1228.06	5	5	reweighed 1228.01 mg ✓	
	E	15	1227.91	1232.58	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Qalfish
Date Verified: Oct. 20/04

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris) | Start Date (Day 0): August 27, 2004

EVS Project No.: 09-0302-54 | Sample ID: Cu Ref/tox

EVS Work Order No.: 0400384 | Balance Type/Serial Number: Sartorius BP 211D

Sample ID 49/L	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
100.0	A	A16	1231.06	1234.17	23 4	23 4		~
	B	17	1232.73	1336.19	5	5		
	C	18	1227.40	1232.10	5	5		
	D	19	1225.62	1227.27	2	2		
	E	20	1229.98	1233.36	3	3		
180.0	A	21	1233.34	1235.48	2	2	pre-wt: 1233.29	
	B	22	1226.36		0			
	C	23	1228.36					
	D	24	1229.37					
	E	25	1226.55					
320.0	A	26	1219.08					
	B	27	1224.60					
	C	28	1229.45					
	D	29	1236.52					
	E	30	1236.61					

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Qalfish | Date Verified: Oct 20/04

Test: LF-Larval Fish Growth and Survival Test
Test ID: RTAACu39
Species: AA-Atherinops affinis
Protocol: EPAW 95-EPA West Coast
Sample ID: REF-Ref Toxicant
Sample Type: CU-Copper
Start Date: 8/27/2004 End Date: 9/3/2004
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1240.48	1236.92
	2	2	D-Control	5							5	5	1239.67	1234.84
	3	3	D-Control	5							5	5	1238.43	1233.83
	4	4	D-Control	5							5	5	1239.99	1234.81
	5	5	D-Control	5							5	5	1241.27	1236.78
	6	1	32.000	5							4	4	1239.45	1236.55
	7	2	32.000	5							5	5	1227.87	1223.58
	8	3	32.000	5							5	5	1233.01	1228.35
	9	4	32.000	5							5	5	1240.6	1236.84
	10	5	32.000	5							5	5	1235.34	1230.58
	11	1	56.000	5							5	5	1244.89	1240.99
	12	2	56.000	5							5	5	1243.8	1240.22
	13	3	56.000	5							5	5	1236.09	1232.03
	14	4	56.000	5							5	5	1228.06	1222.7
	15	5	56.000	5							5	5	1232.58	1227.91
	16	1	100.000	5							4	4	1234.17	1231.06
	17	2	100.000	5							5	5	1236.19	1232.73
	18	3	100.000	5							5	5	1232.1	1227.4
	19	4	100.000	5							2	2	1227.27	1225.62
	20	5	100.000	5							3	3	1233.36	1229.98
	21	1	180.000	5							2	2	1235.48	1233.34
	22	2	180.000	5							0	0	0	0
	23	3	180.000	5							0	0	0	0
	24	4	180.000	5							0	0	0	0
	25	5	180.000	5							0	0	0	0
	26	1	320.000	5							0	0	0	0
	27	2	320.000	5							0	0	0	0
	28	3	320.000	5							0	0	0	0
	29	4	320.000	5							0	0	0	0
	30	5	320.000	5							0	0	0	0

Comments: 09-0302-54, 0400384

Reviewed by: Galfich 04-20104

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/27/2004	Test ID:	RTAACu39	Sample ID:	REF-Ref Toxicant
End Date:	9/3/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	09-0302-54, 0400384				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
32	0.8000	1.0000	1.0000	1.0000	1.0000
56	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.8000	1.0000	1.0000	0.4000	0.6000
180	0.4000	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

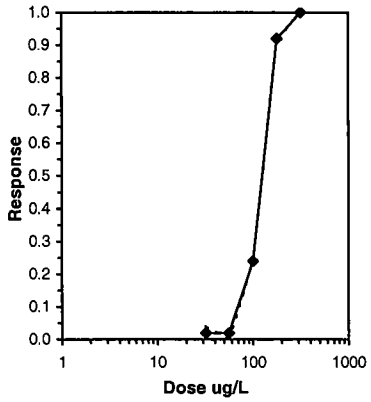
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5			0	25
32	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
56	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	17.00	0	25
100	0.7600	0.2608	1.0737	0.6847	1.3453	26.959	5	20.00	17.00	6	25
*180	0.0800	0.1789	0.3174	0.2255	0.6847	64.711	5	15.00	17.00	23	25
320	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5			25	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.87543	0.888	0.19148	2.19139
Equality of variance cannot be confirmed				

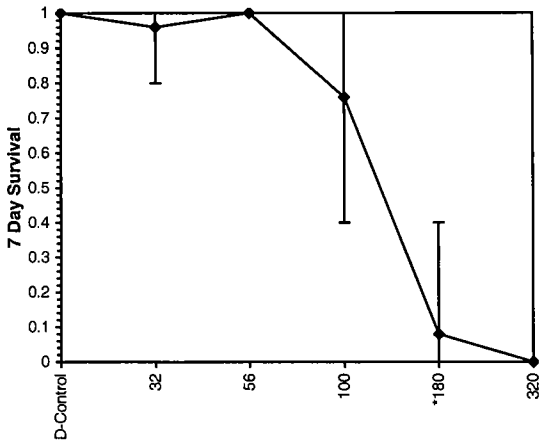
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	180	134.164	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%	121.21	107.05	137.25	
10.0%	122.51	106.69	140.68	
20.0%	124.90	100.06	155.92	
Auto-2.0%	121.16	107.14	137.03	ug/L Cu



Dose-Response Plot



Reviewed by: Oct 20/04

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/27/2004	Test ID:	RTAACu39	Sample ID:	REF-Ref Toxicant
End Date:	9/3/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	09-0302-54, 0400384				

Conc-ug/L	1	2	3	4	5
D-Control	0.7120	0.9660	0.9200	1.0360	0.8980
32	0.5800	0.8580	0.9320	0.7520	0.9520
56	0.7800	0.7160	0.8120	1.0720	0.9340
100	0.6220	0.6920	0.9400	0.3300	0.6760
180	0.4280	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

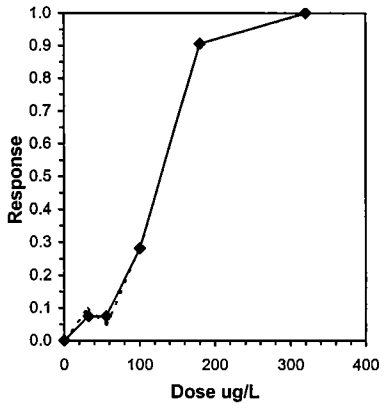
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9064	0.1208	0.9064	0.7120	1.0360	13.330	5				0.9064	1.0000
32	0.8148	0.1529	0.8148	0.5800	0.9520	18.764	5	0.859	2.300	0.2451	0.8388	0.9254
56	0.8628	0.1413	0.8628	0.7160	1.0720	16.373	5	0.409	2.300	0.2451	0.8388	0.9254
*100	0.6520	0.2178	0.6520	0.3300	0.9400	33.401	5	2.387	2.300	0.2451	0.6520	0.7193
*180	0.0856	0.1914	0.0856	0.0000	0.4280	223.607	5	7.701	2.300	0.2451	0.0856	0.0944
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5				0.0000	0.0000

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97983		0.888		0.24836	0.34826
Bartlett's Test indicates equal variances (p = 0.81)					1.6194		13.2767			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	56	100	74.8331		0.24513	0.27045	0.56964	0.0284	9.0E-07	4, 20

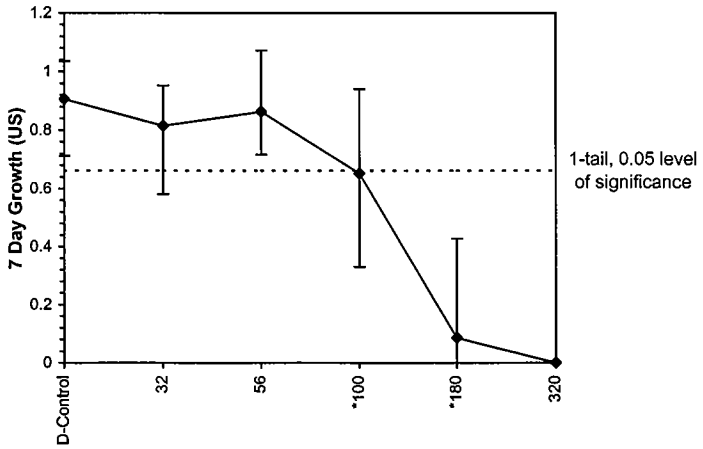
Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew	
IC05*	21.45	21.58	1.69	91.64	0.6918	
IC10	61.43	22.13	0.00	103.56	-0.1239	
IC15	72.10	20.41	1.19	118.52	-0.5135	
IC20	82.78	15.91	41.12	121.23	-0.0104	
IC25	93.45	13.98	53.16	124.15	0.0254	
IC40	115.28	11.42	71.83	139.88	-0.3487	
IC50	128.08	10.81	84.76	150.27	-0.4718	ug/L Cu

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Reviewed by: Oct-20/04

APPENDIX B

Raw Data and Statistical Analyses:

Dendraster excentricus

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: AZIMUTH CONSULTING GROUP
EVS Project No.: 09-0302-54/04-1424-044
EVS Work Order No.: 0400385
EVS Analysts: KES / AKN
Test Initiation Date: 27 AUGUST 2004

SAMPLE

Identification: G-CREEK-082404
Amount Received: 5X20L
Date Collected: 24 AUGUST 2004
Date Received: 27 AUGUST 2004
Temperature (°C): 15.0
pH: 8.0
Dissolved Oxygen (mg/L): 10.0 ① 8.5
Conductivity (µmhos/cm): 9240
Salinity (ppt): 5 ① 28
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —
Other: ① Salinity adjustment

TEST SPECIES

Organism: Dendraster excentricus
Source: Westcoast Sealab Supplies / 27 Aug 2004
Date Received: 27 August 2004
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 27 August 2004
IC50 (and 95% CL): 2.3 (2.1-2.4) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.9 ± 4.6 mg/L SDS; CV% = 60

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV Sterilized, 0.5µm filtered SW
Temperature (°C): 16.0
pH: 8.0
Dissolved Oxygen (mg/L): 8.3
Salinity (ppt): 28
Other: —

TEST CONDITIONS

Temperature Range (°C): 15.0 - 16.0
pH Range: 8.0 - 8.1
Dissolved Oxygen Range (mg/L): 8.2 - 8.5
Salinity Range (ppt): 28
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC50: 50.7 (48.1 — 53.6) % v/v
IC25: 17.5 (11.6 - 22.6) % v/v
NOEC: 4.7 % v/v
LOEC: 9.4 % v/v

Data Verified By: [signature]
Date Verified: Oct. 26/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client: Azimuth Consulting Group
EVS Project No.: 09-0302-54/04-1424-044
EVS Work Order No.: 0400385
Logbook: Echinoid #13 Pages: 53-57

Test Initiation Date/Time: 27 August 2004 @ 13:34
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab Supplies/27 August 2004
Test Duration: 10:10

Sample ID Q-CREEK 082404	Conc/Rep % V/V	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
CONTROL		16.0	8.0	28	8.3	
BRINE CTL		16.0	8.1	28	8.3	
	4.7	16.0	8.0	28	8.2	
	9.4	16.0	8.0	28	8.3	
	18.8	16.0	8.0	28	8.3	
	37.5	15.5 16.0	8.0	28	8.2	
	75.1	15.0 16.0	8.0	28	8.5	
Tech. Init.	Kaf	Kaf	Kaf	Kaf	Kaf	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51 Salinity II-A-030303 DO II-A-011202

Data Verified By: Ralph Date Verified: Oct. 26/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: AZIMUTH CONSULTING GROUP
EVS Project No.: 09-0302-54/04-1424-044
EVS Work Order No.: 0400385
Logbook: Echinoid #13 Pages: 53-57

Test Initiation Date/Time: 27 AUGUST 2004 @ 13:34
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab Supplies/27 August 2004
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID (% v/v)	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
4.7	A	78	22		
	B	74	26		
	C	76	24		
	D	72	28		
9.4	A	61	39		
	B	62	38		
	C	62	38		
	D	60	40		
18.8	A	56	44		
	B	58	42		
	C	~~41~~ 59	41		
	D	55	45		
37.5	A	49	51		
	B	50	50		
	C	50	50		
	D	48	52		
75.1	A	25	75		
	B	27	73		
	C	24	76		
	D	27	73		
CONTROL SEA WATER	A	77	~~29~~ 23		
	B	80	20		
	C	74	26		
	D	77	23		

Data Verified By: Qalfish
Date Verified: Oct. 26/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth Consulting Group.
EVS Project No.: 09-0302-54/04-1424-044
EVS Work Order No.: 0400385
Logbook: Echinoid #13 Pages: 53 – 57

Test Initiation Date/Time: 27 August 2004 @ 13:34
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab Supplies/27 August 2004
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
BRINE CONTROL	A	76	24		KF
	B	73	27		↓
	C	79	21		↓
	D	77	23		↓
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Data Verified By: Ralph Ky Date Verified: Oct. 21/04

Test: SC-Sperm Cell Fertilization test					Test ID: 0400385		
Species: DE-Dendraster excentricus					Protocol: EPS1/RM/27-EC 92 (Sperm Cell)		
Sample ID: G CREEK-082404					Sample Type: EFF2-Industrial		
Start Date: 8/27/2004 10:10			End Date: 8/27/2004		Lab ID: BCEVS-EVS Environment Consultants		
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	77	23	
	2	2	D-Control	100	80	20	
	3	3	D-Control	100	74	26	
	4	4	D-Control	100	77	23	
	5	1	B-Control	100	76	24	
	6	2	B-Control	100	73	27	
	7	3	B-Control	100	79	21	
	8	4	B-Control	100	77	23	
	9	1	4.700	100	78	22	
	10	2	4.700	100	74	26	
	11	3	4.700	100	76	24	
	12	4	4.700	100	72	28	
	13	1	9.400	100	61	39	
	14	2	9.400	100	62	38	
	15	3	9.400	100	62	38	
	16	4	9.400	100	60	40	
	17	1	18.800	100	56	44	
	18	2	18.800	100	58	42	
	19	3	18.800	100	59	41	
	20	4	18.800	100	55	45	
	21	1	37.500	100	49	51	
	22	2	37.500	100	50	50	
	23	3	37.500	100	50	50	
	24	4	37.500	100	48	52	
	25	1	75.100	100	25	75	
	26	2	75.100	100	27	73	
	27	3	75.100	100	24	76	
	28	4	75.100	100	27	73	

Comments: Azimuth Consulting Group (Polaris), 09-0302-54 (0400385)

Reviewed by: Oct 26/04

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/27/2004 10:10	Test ID:	400385	Sample ID:	G CREEK-082404
End Date:	8/27/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	8/24/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm (	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris), 09-0302-54 (0400385)				

Conc-%	1	2	3	4
D-Control	0.7700	0.8000	0.7400	0.7700
B-Control	0.7600	0.7300	0.7900	0.7700
4.7	0.7800	0.7400	0.7600	0.7200
9.4	0.6100	0.6200	0.6200	0.6000
18.8	0.5600	0.5800	0.5900	0.5500
37.5	0.4900	0.5000	0.5000	0.4800
75.1	0.2500	0.2700	0.2400	0.2700

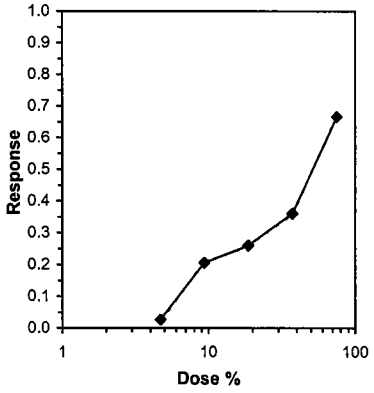
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7700	0.0245	0.7700	0.7400	0.8000	3.181	4				0.7700	1.0000
B-Control	0.7625	0.0250	0.7625	0.7300	0.7900	3.279	4					
4.7	0.7500	0.0258	0.7500	0.7200	0.7800	3.443	4	1.546	2.410	0.0312	0.7500	0.9740
*9.4	0.6125	0.0096	0.6125	0.6000	0.6200	1.563	4	12.175	2.410	0.0312	0.6125	0.7955
*18.8	0.5700	0.0183	0.5700	0.5500	0.5900	3.203	4	15.460	2.410	0.0312	0.5700	0.7403
*37.5	0.4925	0.0096	0.4925	0.4800	0.5000	1.944	4	21.450	2.410	0.0312	0.4925	0.6396
*75.1	0.2575	0.0150	0.2575	0.2400	0.2700	5.825	4	39.616	2.410	0.0312	0.2575	0.3344

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96771	0.884	-0.0461	-0.3022
Bartlett's Test indicates equal variances (p = 0.47)	4.56528	15.0863		
The control means are not significantly different (p = 0.68)	0.42857	2.44691		

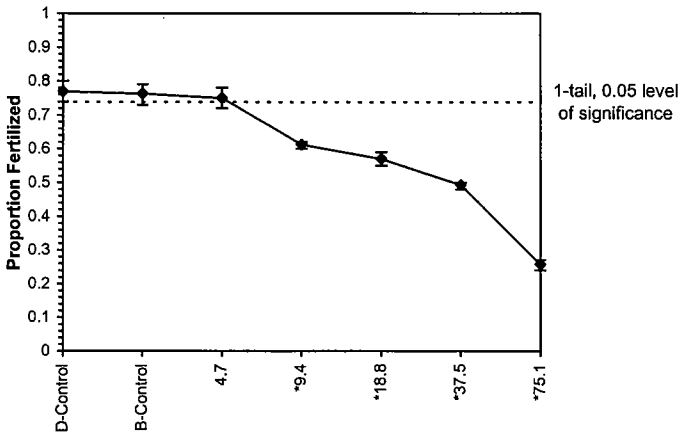
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	4.7	9.4	6.6468	21.2766	0.03118	0.04049	0.14215	0.00033	5.1E-18	5, 18

Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05	5.180	0.661	1.565	6.056	-2.4799	
IC10	6.314	0.363	5.072	7.317	-0.3761	
IC15	7.655	0.380	6.468	8.804	-0.0227	
IC20	9.242	0.946	8.159	13.672	1.6390	
IC25	16.673	2.353	10.367	23.598	0.0429	
IC40	41.060	0.897	38.450	44.063	-0.0075	
IC50	51.581	0.976	49.063	54.697	0.0961	%v/v



Dose-Response Plot



Statistical comparisons were against the D-control

Reviewed by: Oct-26/04

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/27/2004 10:10	Test ID:	400385	Sample ID:	G CREEK-082404
End Date:	8/27/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:	8/24/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm (	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris), 09-0302-54 (0400385)				

Conc-%	1	2	3	4
D-Control	0.7700	0.8000	0.7400	0.7700
B-Control	0.7600	0.7300	0.7900	0.7700
4.7	0.7800	0.7400	0.7600	0.7200
9.4	0.6100	0.6200	0.6200	0.6000
18.8	0.5600	0.5800	0.5900	0.5500
37.5	0.4900	0.5000	0.5000	0.4800
75.1	0.2500	0.2700	0.2400	0.2700

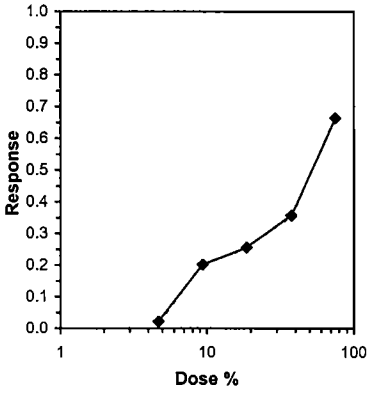
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.7663	0.0233	0.7663	0.7300	0.8000	3.036	8				0.7663	1.0000
4.7	0.7500	0.0258	0.7500	0.7200	0.7800	3.443	4	1.390	2.508	0.0293	0.7500	0.9788
*9.4	0.6125	0.0096	0.6125	0.6000	0.6200	1.563	4	13.156	2.508	0.0293	0.6125	0.7993
*18.8	0.5700	0.0183	0.5700	0.5500	0.5900	3.203	4	16.793	2.508	0.0293	0.5700	0.7439
*37.5	0.4925	0.0096	0.4925	0.4800	0.5000	1.944	4	23.424	2.508	0.0293	0.4925	0.6427
*75.1	0.2575	0.0150	0.2575	0.2400	0.2700	5.825	4	43.533	2.508	0.0293	0.2575	0.3361

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98075	0.896	-0.1412	-0.2089
Bartlett's Test indicates equal variances (p = 0.44)	4.83474	15.0863		
The control means are not significantly different (p = 0.68)	0.42857	2.44691		

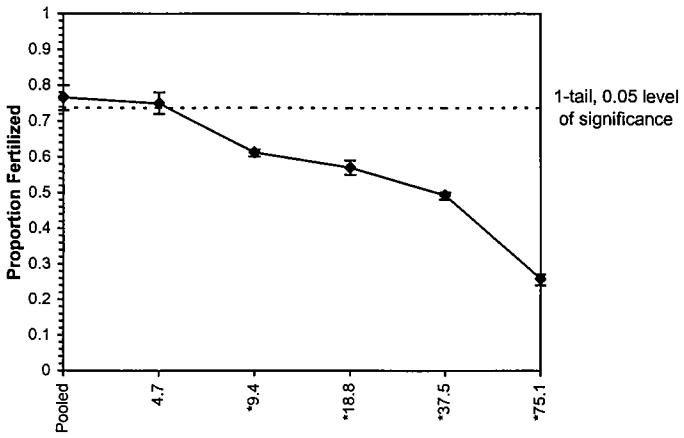
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	4.7	9.4	6.6468	21.2766	0.02931	0.03826	0.16613	0.00036	1.9E-21	5, 22

Log-Logit Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05	5.346	0.452	3.380	6.032	-1.8281	
IC10	6.555	0.307	5.439	7.178	-0.4707	
IC15	7.892	0.273	6.858	8.579	-0.3014	
IC20	9.379	0.715	8.461	12.502	1.9342	
IC25	17.460	2.031	11.554	22.636	0.0330	
IC40	40.999	0.628	38.998	42.863	0.1265	
IC50	50.738	0.809	48.086	53.622	0.1685	%v/v



Dose-Response Plot



Statistical comparisons were against the ~~B-control~~
Pooled Control

Reviewed by: Qualified
Oct-26/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting Group
EVS Project No.: 09-0302-54/04-1424-044
EVS Work Order No.: 0400385
EVS Analysts: KES, AKN
Test Initiation Date: 27 AUGUST 2004

SAMPLE

Identification: SDS RefTox Stock Sol^n
Amount ~~Received~~ Prep'd: 1X1L
Date ~~Collected~~ Prep'd: 26 April 2004
Date Received: n/a
Temperature (°C):
pH:
Dissolved Oxygen (mg/L):
Conductivity (µmhos/cm):
Salinity (ppt):
Ammonia (mg/L N):
Chlorine (mg/L Cl):
Other:

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab Supplies
Date Received: 27 August 2004
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 27 August 2004
IC50 (and 95% CL): 2.3 (2.1-2.4) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.9 ± 4.6 mg/L SDS, CV% = 60

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV Sterilized, 0.5µm filtered SW
Temperature (°C): 16.0
pH: 8.0
Dissolved Oxygen (mg/L): 8.3
Salinity (ppt): 28
Other: —

TEST CONDITIONS

Temperature Range (°C): 16.0
pH Range: 8.0
Dissolved Oxygen Range (mg/L): 8.3
Salinity Range (ppt): 28
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC 50: 2.3 (2.1-2.4) mg/L SDS
IC 25: 1.3 (1.2-1.4) mg/L SDS
NOEC: <1 mg/L SDS
LOEC: 1 mg/L SDS

Data Verified By: [signature]
Date Verified: Oct. 26/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth Consulting Group
EVS Project No. 09-0302-54 / 04-1424-044
EVS Work Order No. 0400385
Logbook Echinoid #13 Pages 53 - 57

Test Initiation Date/Time 27 August 2004 @ 13:34
Test Species Dendraster excentricus
Source/Date Received Westcoast Sealab Supplies / 27 Aug 2004
Test Duration 10:10

Sample ID	Conc/Rep	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
SDS mg/L	CONTROL	16.0	8.0	28	8.3	
	1.0	16.0	8.0	28	8.3	
	1.8	16.0	8.0	28	8.3	
	3.2	16.0	8.0	28	8.3	
	5.6	16.0	8.0	28	8.3	
	10.0	16.0	8.0	28	8.3	
Tech. Init.	KAF	KAF	KAF	KAF	KAF	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51 Salinity II-A-030303 DO II-A-011202
Data Verified By Ralph K Date Verified Oct 21/04

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNTS (CONTROLS)

Client: Azimuth Consulting Group
Test Initiation Date/Time: 27 August 2004 @13:34
EVS Project No.: 09-0302-54/04-1424-044
Test Species: Dendraster excentricus
EVS Work Order No.: 0400385
Test Duration: 10:10
Logbook: Echinoid #13 Pages: 53-57
Sperm:Egg Ratio: 2000:1

Concentration SDS mg/L	Replicate	No. Fertilized Eggs	No. Unfertilized Eggs	Comments	Tech. Initials
Reference Toxicant					
1.0	A	70	30		[illegible]
	B	72	28		↓
	C	69	31		
	D	68	32		↓
1.8	A	45	55		[illegible]
	B	47	53		↓
	C	46	54		
	D	49	51		↓
3.2	A	25	75		[illegible]
	B	26	74		↓
	C	24	76		
	D	27	73		↓
5.6	A	10	90		[illegible]
	B	14	86		↓
	C	9	91		
	D	10	90		↓
10.0	A	2	98		[illegible]
	B	2	98		↓
	C	1	99		
	D	2	98		↓
Control Seawater					
	A	~~81~~ 77	23		[illegible]
	B	~~76~~ 80	20		↓
	C	74	26		
	D	77	23		↓

Data Verified By: [signature] Date Verified: Oct. 21/04

Test: SC-Sperm Cell Fertilization test					Test ID: rtscsds9		
Species: DE-Dendraster excentricus					Protocol: EPS1/RM/27-EC 92 (Sperm Cell)		
Sample ID: REF-Ref Toxicant					Sample Type: SDS-Sodium dodecyl sulfate		
Start Date: 8/27/2004 10:10			End Date: 8/27/2004		Lab ID: BCEVS-EVS Environment Consultants		
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	77	23	
	2	2	D-Control	100	80	20	
	3	3	D-Control	100	74	26	
	4	4	D-Control	100	77	23	
	5	1	1.0	100	70	30	
	6	2	1.0	100	72	28	
	7	3	1.0	100	69	31	
	8	4	1.0	100	68	32	
	9	1	1.8	100	45	55	
	10	2	1.8	100	47	53	
	11	3	1.8	100	46	54	
	12	4	1.8	100	49	51	
	13	1	3.2	100	25	75	
	14	2	3.2	100	26	74	
	15	3	3.2	100	24	76	
	16	4	3.2	100	27	73	
	17	1	5.6	100	10	90	
	18	2	5.6	100	14	86	
	19	3	5.6	100	9	91	
	20	4	5.6	100	10	90	
	21	1	10.0	100	2	98	
	22	2	10.0	100	2	98	
	23	3	10.0	100	1	99	
	24	4	10.0	100	2	98	

Comments: Azimuth Consulting Group 09-0302-54 (0400385)

Reviewed by: 04/21/06

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/27/2004 10:10	Test ID:	rtscsds9	Sample ID:	REF-Ref Toxicant
End Date:	8/27/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	SDS-Sodium dodecyl sulfate
Sample Date:		Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group 09-0302-54 (0400385)				

Conc-mg/L	1	2	3	4
D-Control	0.7700	0.8000	0.7400	0.7700
1	0.7000	0.7200	0.6900	0.6800
1.8	0.4500	0.4700	0.4600	0.4900
3.2	0.2500	0.2600	0.2400	0.2700
5.6	0.1000	0.1400	0.0900	0.1000
10	0.0200	0.0200	0.0100	0.0200

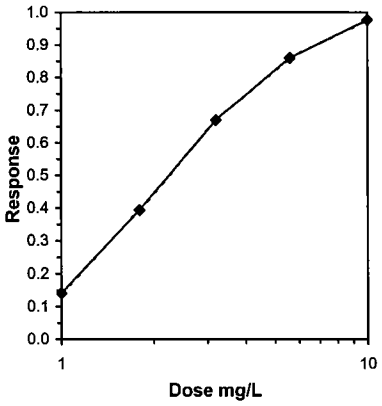
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7700	0.0245	0.7700	0.7400	0.8000	3.181	4					
*1	0.6975	0.0171	0.6975	0.6800	0.7200	2.448	4	5.813	2.410	0.0301		
*1.8	0.4675	0.0171	0.4675	0.4500	0.4900	3.653	4	24.254	2.410	0.0301		
*3.2	0.2550	0.0129	0.2550	0.2400	0.2700	5.063	4	41.292	2.410	0.0301		
*5.6	0.1075	0.0222	0.1075	0.0900	0.1400	20.627	4	53.118	2.410	0.0301		
*10	0.0175	0.0050	0.0175	0.0100	0.0200	28.571	4	60.334	2.410	0.0301		

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.94353		0.884		0.48689	0.03974
Bartlett's Test indicates equal variances (p = 0.33)					5.73659		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	<1	1			0.03006	0.03904	0.38532	0.00031	3.5E-22	5, 18

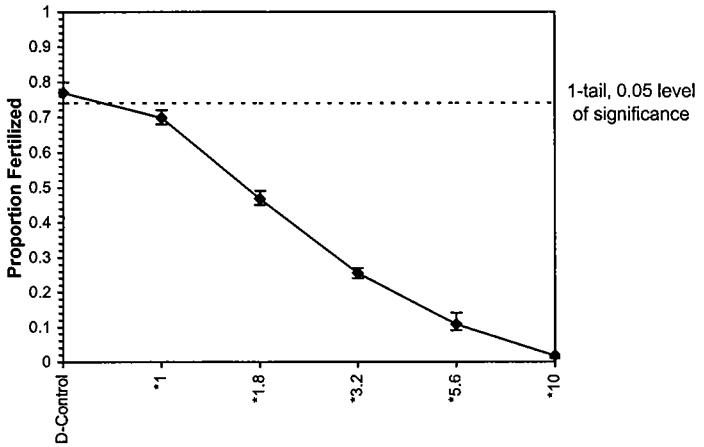
Log-Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew	
IC05*	0.2818	0.0398	0.1777	0.4281	0.4398	
IC10*	0.6429	0.1027	0.3830	1.0315	0.5219	
IC15	1.0278	0.0806	0.6655	1.1534	-1.2547	
IC20	1.1671	0.0441	1.0139	1.2853	-0.3348	
IC25	1.3159	0.0419	1.1718	1.4292	-0.2285	
IC40	1.8295	0.0507	1.6670	1.9678	-0.0985	
IC50	2.2774	0.0469	2.1219	2.4035	-0.2200	mg/L SDS

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Reviewed by: Oct-21/04

APPENDIX C

Chain-of-Custody Form

CHAIN-OF-CUSTODY/TEST REQUEST FORM

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Client Name: Azimuth Consulting for TEQK Comined
Client Contact Name: Cheryl Mackintosh / Bruce Donald
Address: 218-2902 West Broadway Vancouver BC, V6K 2G8
Phone: 604-730-1220
Fax: 604-739-9070
Sampled By: ~~Randy Baker~~ C. Mackintosh

Ship to: EVS Environment Consultants
195 Pemberton Ave.
North Vancouver, BC, V7P 2R4
Shipping Date: Aug. 25, 2004
Attn: Edmund Canavia

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested: Rainbow trout 96-hr LC50	Daphnia magna 48-hr LC50	7-day Topsmelt	Echinoderm 48h fertilization			3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)	Lab Use Only
For composite sample record date & time starting and ending															
24/Aug/04	15:00	G-Creek ~~081704~~ 082404 (1)	E		Grab	5x20L	CC	✓	✓	✓	✓			Freshwater ~2.4 ppt	1574

PO/Reference No.: TC-03-03
Project Title: Polaris MMER
Results Needed By:

Comments/Instructions: (1) The sample ID was changed from G-Creek 081704 to G-Creek 082404 by the client's request.

EVS Receipt Check List

EVS Project #: 04-1168-01
EVS Workorder #: 04000382 1383 1384 1385
Sample Storage Location: RAT CHEM DPHM TOPSMT ECH
Sample Receipt Documentation/Other Information Attached, if applicable: Y N
1. Signatures & dates correct? Y N
2. Chain of custody fully completed? Y N
3. Containers received in good condition (unbroken)? Y N
4. Container labels completed (i.e., dates, preservation)? Y N
5. Container labels agreed with custody papers? Y N
6. Sample receipt temperature within acceptable range? Y N
7. Sediment testing logged to be initiated within 24 days? Y N
7b. If no, are samples under Nitrogen? If not, why?
8. Chain of custody generated upon receipt? Y N
9. Sample containers originate from EVS? Y N

A) Released By: C. Mackintosh Date: Aug. 25/04
Company: Azimuth Time: 9:00am
Courier name: First air / FedEx
Shipping containers secured by: (Tape) Straps Lock Other _____ (circle one)
Custody seals used? Yes No METAL STRIPS

B) Received by: AXF Date: 27 AUG 04
Company: EUS Time: 0945
Shipping containers received secure? (Yes) No
Custody seals intact? (Yes) No N/A

C) Released By: Date:
Company: Time:
Courier name:
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify)
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

Distribution of copies:
White, yellow, pink - accompany the shipment
Orange - retained by consignor (e.g., shipper)
Yellow - retained by consignee (e.g., receiver)
Pink - for use as needed
White - returned to consignor by consignee

APPENDIX F

Letter from Environment Canada to Teck Cominco Metals, Ltd. re: Polaris 2004 Annual Report (dated August 9, 2005)

Environment Canada | Environnement Canada
Prairie & Northern Region
Environment Canada
Rm 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Bruce Donald
Cominco Mining Partnership & Teck Cominco Metals Ltd.
Bag 2000
Kimberley, BC
V1A3E1

August 9, 2005

Dear Bruce Donald,

RE: Polaris 2004 Annual Report

In our review of the Polaris 2004 Annual Effluent and Water Quality Report, due March 31, 2005, it was noted that some Environmental Effects Monitoring (EEM) information does not appear to have been provided as required under Metal Mining Effluent Regulations (Schedule 5, Part 1). Please see the appended list of deficiencies relating to effluent characterization, water quality monitoring and sublethal toxicity testing for your facility.

If missing information was collected but not included in the above report, please submit this information to Environment Canada by September 30, 2005. Please ensure that all deficiencies are addressed in future reports. Failure to provide all information required under the Environmental Effects Monitoring Program will result in non-compliance.

Please be reminded that guidance is provided on the National EEM Website to assist you, at http://www.ec.gc.ca/eem/English/Publications/web_publication/ec_water/.
If you have any questions, please do not hesitate to contact me [Phone (780) 951-8754, jenny.ferone@ec.gc.ca].

Sincerely,

Paula Siwik (for)
Jenny Ferone, Regional EEM Coordinator

cc Peter Blackall
Chuck Brumwell
Ken Russell

Recycled Paper / Papier Recyclé

Polaris (7834-3-37/C263-9)
2004 Annual Effluent and Water Quality Review

General:

- Methods, detection limits, and QA/QC need to be included in the future.
- Latitude/longitude and description of reference and exposure areas need to be included in hard copy.
- No units given in the hard copy for measured parameters in the Effluent or Water Quality tables.

Effluent Characterization:

- Collected and analyzed four effluent samples, but due to short discharge period (July and August only) only two were more than one month apart. Remaining two were only three days short of being one month apart.
- No methods described or detection limits, no QA/QC data or description.

Water Quality:

- Only two water sampling dates were more than one month apart due to short sampling period (July and August). Three samples were analyzed.
- No latitude or longitude of reference or exposure sampling areas in hard copy; No description of the ref or exp area – both described as Garrow Bay.
- No methods described or detection limits, no QA/QC data or description.

Sublethal Toxicity:

Please note that laboratories performing sublethal tests should provide all information required on the Environment Canada checklists (Annex C of the Metal Mining Guidance Document).

- A subset of the sublethal reports submitted by mines in the Prairie and Northern Region were sent for independent verification by Environment Canada toxicologists. This subset includes the test results submitted by your facility. We will inform you of any additional sublethal deficiencies identified by our reviewers once they have finished their review.
- For first sampling LC50 reported twice for fish species.
- First and second sampling: No LC50 done for sand dollar.
- All comments below are for both sampling dates (July 27 and August 24) unless otherwise stated

Atherinops affinis

- Information on labeling/coding of sample was not reported.
- Temperature of sample upon arrival at lab was not reported.
- The date that the sample was received at the lab was not reported.
- Dates or days during test when sub-samples or multiple samples were used, was not reported.
- The date for test completion was not reported.
- Temperature, DO, pH, and salinity of test solution and controls were not reported for each 24hr exposure period. They were only reported for the start of the test.
- Only give the final average mortality for each test concentration instead of the mortality as noted during each 24hr observation period

- Only give the average dry weight of each concentration instead of for each replicate of each concentration – also no indication if preserved in formalin/ethanol or not. If not preserved then 2 test concentration have weights <0.85mg (17.3% & 69%).
- No preparation procedure of salinity adjustment was reported.

Champia parvula

- Information on labeling and coding of sample was not reported.
- The date for sample receipt at the lab was not reported.
- The date for test completion was not reported.
- Procedure and preparation of the hypersaline brine was not reported.
- The type and quantity of chemicals (if any) added to the control/dilution water was not reported.
- Temperature, DO, pH and salinity of test solutions and controls were not reported for the start and 48hr of the exposure period or for the beginning and end of the recovery period.
- No note if there was anything unusual about the test organism prior to the test or if there was anything unusual about the test itself.
- Only the mean # of cystocarps per plant for each test concentration was reported. Needed to report the mean # of cystocarps per plant in each test vessel (in each replicate of each conc. and controls).
- No indication of quantitative statistic used to determine IC25 value.

Dendraster excentricus

- Information on labeling/coding of sample, the date it was received and its temperature upon arrival at lab were all not reported.
- There was no mention of the condition of the adult organisms prior to use.
- No note if there was anything unusual about the test organisms prior to use or anything unusual about the test itself.
- No procedure for salinity adjustment was reported – only statement that they followed EC guidance document.
- Only 100eggs/ vessel were used – should have been 2000 for the 10mL test volume.
- No indication of quantitative statistic used to determine the IC25 value.

APPENDIX G

Letter from Azimuth Consulting Group, Inc. to Environment Canada re: Clarification of reporting issues outlined in August 9, 2005 letter (dated September 14, 2005)

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC
Canada V6K 2G8

Phone: 604-730-1220
Fax: 604-739-8511
www.azimuthgroup.ca

Jenny Ferone
Regional EEM Coordinator
Prairie & Northern Region
Environment Canada
Rm 200, 4999 98th Ave.
Edmonton, AB, T6B 2X3

September 14, 2005

Dear Ms. Ferone,

Re: Clarification of reporting issues outlined in Environment Canada's letter to Teck Cominco regarding the Polaris 2004 EEM Annual Report

This letter is being written on behalf of Teck Cominco Metals Ltd. in response to Environment Canada's letter to Teck Cominco, dated August 9, 2005, regarding purported deficiencies in the Polaris 2004 Annual Effluent and Water Quality Report. Azimuth staff prepared the report and will be addressing the issues outlined in your letter by providing a revised 2004 EEM Annual Report. However, there are a few questions and clarifications that we would like to draw to your attention, to ensure that we include all required information in the revised report and that there are no misunderstandings or further deficiencies. Our specific responses to each of the points raised in the review letter are as follows:

General:

- Methods, detection limits and QA/QC will be included in all future reports
- Latitude and longitude and a description of the reference and exposure areas will be provided in the hard copy
- Units for water quality will be provided

Effluent Characterization:

- Effluent was collected and tested within allowable time periods, given the short duration of effluent discharge at Polaris.
- Methods, detection limits and QA/QC will be provided in the hard copy

Water Quality:

- Sampling of water quality was optimized to collect as many samples as possible, given short duration of discharge
- Latitude and longitude of exposure and reference areas were provided in the electronic copy; these will also be provided in the hard copy
- Methods, detection limits and QA/QC will be provided in the hard copy

Sublethal Toxicity:

- *"The first sampling LC50 reported twice for fish species."* We presume the reviewers referring to the topsmelt tests. If so, we conducted 3 acute lethality tests on topsmelt in 2004. Results of all three tests are reported in the EEM under point *iii* of the Results. These values are listed as >72.6%, >69.0% and >71.0%.
- *"First and second sampling: No LC50 done for sand dollar."* The sand dollar test is strictly a sublethal fertilization test, and no LC50 is measured.

Atherinops affinis

- Information on labeling and coding of samples will be reported
- Temperature on sample receipt at the lab will be reported.
- Date of sample receipt at the lab will be reported
- Dates or days when sub- or multiple samples were used will be reported
- Date for test completion will be reported
- *"Temperature, DO, pH, and salinity of test solution and controls were not reported for each 24hr exposure period…"* The laboratory (EVS) hand writes temperature, DO and pH on hard copy forms and does not enter these electronically. PDF copies of these forms will be provided with our hard copy report.
- *"Only give the final average mortality for each test concentration instead of the mortality as noted during each 24hr observation period."* As above, these are written by hand in hard copy by the lab. PDF copies will be provided with the final report.
- *Comment regarding the dry weights of each replicate for each test concentration… "If not preserved then 2 test concentration have weights <0.85mg (17.3%, and 69%)."* Dry weights will be reported for each replicate of each concentration. Note that the 0.85mg test validity benchmark only refers to the **controls**. If there is a sublethal effect, such as slower growth, exposed animals will necessarily weigh less than the control and may weigh less than 0.85 mg.
- *"No preparation procedure of salinity adjustment was reported."* Information regarding salinity adjustment was presented under point *ix* under Test Facilities and Conditions. The following text was included:

    ix. Indication that EC guidance document for salinity adjustment was followed

    - *The following was done for all 3 tests:*
        - *No deviations from EC guidance document on preparation of hypersaline brine (HSB)*

- *HSB prepared from natural seawater concentrated to 90ppt (by freezing/refreezing to remove frozen layer and concentrate salts)*
- *No deviations from EC guidance document for salinity adjustment of sample*
- *HSB was added to samples to salinity adjust them to 30ppt*

We presume that this level of information is sufficient. If not, please let us know what additional information is required. Note that for the topsmelt and echinoderm tests, the lab reports state: *"Salinity: 30±2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment – July 1997)"*

Champia parvula

- Information on labeling and coding will be provided in the revised final report
- Date for sample receipt at the lab will be reported
- Date for test completion will be reported
- *"Procedure and preparation of the hypersaline brine was not reported."* Under point *vii*. of Test Conditions and Facilities we indicate:
  - *No deviations from EC guidance document on preparation of hypersaline brine*
  - *HSB prepared from natural seawater at 90ppt*
  - *No deviations from EC guidance document for salinity adjustment of sample*
  - *Salinity adjustment: 600mL effluent + 250mL HSB + 8.5mL test nutrient solution*
  - *Salinity of samples adjusted from 4ppt to 30ppt*

The lab report indicated for hypersaline brine that it was *"Prepared from natural seawater, at 90 ppt salinity.* As per EC guidance document on salinity adjustment"*. We presume that this is a sufficient level of detail. If not, please advise us what additional information the laboratory can provide to satisfy this comment.

- *"No note if there was anything unusual about the test organism prior to the test or if there was anything unusual about the test itself".* We will include appropriate observations about the test in future reports. With regards to the organisms, under point *iii* of Test Organisms we indicated that *"[test species]…*
  - *Sexually mature male and female branches*
  - *Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995*
  - *Appear in good health*
  - *Females have trichogynes, males have sori with spermatia*

  We presume this is a sufficient level of detail. If not, please advise us on what additional information the laboratory can provide to satisfy this comment.
- *"No indication of quantitative statistic used to determine the IC25 value."* Under point *iii*. of Results, we stated *"Quantal statistic method was linear interpolation"* We presumed this was sufficient. Please advise if the reviewer wishes us to elaborate on this method.

Dendraster excentricus

- Information on labeling/coding, date of receipt, temperature at arrival at laboratory will be provided
- *"There was no mention of the condition of the adult organisms prior to use."* Under point *xi* (Test Organisms) it is stated that *"organisms appear healthy"*. We presumed this was sufficient information. If not, please elaborate on what additional level of detail is required.
- Future reports will note if there is anything unusual observed about the organisms or the test.
- *"No procedure for salinity adjustment was reported – only statement that they followed EC guidance document"* Under point *ix* (Test Facilities and Conditions) we make the following comments on hypersaline brine and salinity adjustment.
    - *x. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997*
        - *Test 1: na*
        - *Test 2: 30 ppt adjusted with hypersaline brine (HSB). Preparation of HSB and salinity adjustment as per EC guidance document on Salinity adjustment – July 1997*
        - *Test 2: 30 ppt adjusted with hypersaline brine (HSB). Preparation of HSB and salinity adjustment as per EC guidance document on Salinity adjustment – July 1997*
    - *xi. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997*
        - *No deviations from EC guidance for salinity adjustment*
        - *Test 1: na*
        - *Test 2: salinity adjusted from 2.8 to 28 ppt*
        - *Test 3: salinity adjusted from 5 to 28 ppt*

  We presume that this is a sufficient level of detail and was according to EC guidance. For both topsmelt and echinoderm tests the original lab report methods for salinity state *"30±2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment – July 1997)"* Please advise if your reviewers would like us to obtain more information from the laboratory.
- The laboratory does use 2000 eggs/10 mL, although a subset of 100 eggs are evaluated to determine the overall fertilization rate. We will clarify this.
- Quantitative statistic for determining IC25 will be provided.

We have raised a few issues where further guidance from your office is required. These are stated above as assumptions where clarification is requested from your office. We have incorporated all other appropriate additional information requested by the reviewers into a revised 2004 Polaris Annual Report. Once we have received a response from your office we will finalize this revised report. If we do not have a response from your office by Monday September 26, 2005, we will finalize the report

following our assumptions as stated in this letter, and submit the revised report by the September 30, 2005 deadline.

We would also like to communicate to Environment Canada that the electronic and hardcopy versions of the EEM report are not harmonized, as different information is requested for the two reports. As it is currently, the addition of the electronic report results in a duplication of effort and confuses the reporting requirements, rather than resulting in a more streamlined reporting process.

Sincerely,

Cheryl Mackintosh, M.R.M., R.P.Bio.

Azimuth Consulting Group Inc.
218-2902 Broadway West
Vancouver, BC, V6K 2G8
P: 604-730-1220
F: 604-739-8511
e-mail: cmackintosh@azimuthgroup.ca

APPENDIX H

Polaris Mine – Revised 2004 3rd Quarter Metal Mining Effluent Regulations Report (dated March 22, 2005)

March 22, 2005

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Sir;

Re: Polaris Mine – Revised 2004 3rd Quarter Metal Mining Effluent Regulations Report

Please find attached a **revised** Polaris Mine 3rd Quarter MMER regulatory data tables. The reason for the revision is to ensure consistency between the data entered electronically online through the RISS system, and the hard copy Annual and 3rd Quarter reports provided. As explained in the original 3rd Quarter report cover letter, effluent from Garrow Lake ceased flowing by mid-August but surface run off from adjacent slopes maintained minimal water flow at the designated final discharge point into August. By August 17, there was water at the final discharge point in a pool, but flow was too low to be measured. As a result, regulatory concentration data in the 3rd Quarter had originally been submitted with average daily flows of 0 m^3 per day for the weeks of Aug. 17, Aug. 24, and Aug. 31, 2004. However, we continued to collect effluent, water quality and acute and sublethal toxicity samples on these latter three dates. Upon submitting the regulatory data into the online RISS system for the annual report, these August concentration data were not accepted with a flow rate of zero. Thus a nominal flow rate of 1 m^3 per day was entered. As a result the loadings data set is slightly different from the data submitted in the original 3rd Quarter report. Note that these low flow conditions during August, as well as their implications for effluent sampling, were discussed with Environment Canada representatives early in August.

If you have any questions regarding the annual report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me at any time.

Yours truly,

Original signed by B. Donald
Bruce Donald

Attachments: Revised 2003 3rd Quarter Regulatory Data
cc: Walter Kuit (Teck Cominco Limited)
Randy Baker (Azimuth Consulting Group)

2004 3rd QUARTER MMER REPORT - REVISED

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
5-Jul-04	7-Jul-04	0.00100	0.00265	0.0050	0.00269	0.00442	0.1980	117	0.0200	8.05	Grab
12-Jul-04	13-Jul-04	0.00200	0.00070	0.0050	0.00032	0.00204	0.1060	5.7	0.0070	7.90	Grab
19-Jul-04	20-Jul-04	0.00200	0.00043	0.0050	0.00084	0.00088	0.0435	3.0	0.0050	7.86	Grab
26-Jul-04	27-Jul-04	0.00100	0.00052	0.0050	0.00157	0.00207	0.0429	3.0	0.0050	7.87	Grab
2-Aug-04	3-Aug-04	0.00020	0.00082	0.0050	0.00280	0.00338	0.0349	3.3	0.0060	8.00	Grab
9-Aug-04	10-Aug-04	0.00100	0.00100	0.0055	0.00120	0.00748	0.0482	3.0	0.0050	8.04	Grab
16-Aug-04	17-Aug-08	0.00020	0.00121	0.0050	0.00177	0.00644	0.0418	5.3	0.0100	7.95	Grab
23-Aug-04	24-Aug-04	0.00020	0.00134	0.0050	0.00119	0.00967	0.0498	4.4	0.0080	7.84	Grab
30-Aug-04	31-Aug-04	0.00020	0.00137	0.0050	0.00261	0.01340	0.0794	14.5	0.0080	7.90	Grab
6-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
13-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
20-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
27-Sep-04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
July/04	0.0015	0.00107	0.0050	0.00135	0.00235	0.0976	32	0.0093
August/04	0.0004	0.00115	0.00510	0.00191	0.00807	0.0508	6.1	0.0074
September/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
5-Jul-04	7-Jul-04	0.018	0.048	0.091	0.049	0.080	3.588	2120	362,440	18,122
12-Jul-04	13-Jul-04	0.752	0.264	1.880	0.120	0.767	39.850	2143	2,631,608	375,944
19-Jul-04	20-Jul-04	0.205	0.044	0.512	0.086	0.090	4.458	307	512,395	102,479
26-Jul-04	27-Jul-04	0.028	0.015	0.141	0.044	0.058	1.211	85	141,090	28,218
2-Aug-04	3-Aug-04	0.005	0.022	0.132	0.074	0.089	0.923	87	158,700	26,450
9-Aug-04	10-Aug-04	0.026	0.026	0.142	0.031	0.194	1.248	78	129,470	25,894
16-Aug-04	17-Aug-08	0.000	0.000	0.000	0.000	0.000	0.000	0	0	1
23-Aug-04	24-Aug-04	0.000	0.000	0.000	0.000	0.000	0.000	0	0	1
30-Aug-04	31-Aug-04	0.000	0.000	0.000	0.000	0.000	0.000	0	0	1
6-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0
13-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0
20-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0
27-Sep-04	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note[2] - "nd" refers to no effluent discharge to sample

MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
July/04	7.77	2.87	20.33	2.31	7.71	380.58	36,078.15	28,268,381	131,191	4,066,913
August/04	0.19	0.29	1.70	0.65	1.76	13.46	1,022.95	1,786,654	10,469	324,551
September/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

APPENDIX 21

LIMNOLOGY AND ECOLOGY

OF GARROW LAKE

FINAL
May 2005
Project No.TC-03-03

Limnology and Ecology of Garrow Lake, Little Cornwallis Island, Nunavut - August 2003

Prepared for:

Teck Cominco Metals Ltd.

Bag 2000
Kimberley, BC
V1A 3E1

Prepared by:

AZIMUTH

Azimuth Consulting Group Inc.
218-2902 West Broadway Vancouver,BC V6K 2G8
Tel: 604-730-1220 * Fax: 604-739-8511

Limnology and Ecology of Garrow Lake, Little Cornwallis Island, Nunavut – August 2003

Prepared for

Teck Cominco Metals Ltd.
Bag 2000
Kimberley BC
V1A 3E1

May 2005

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC
V6K 2G8

Project No.

TC–03–03

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GLOSSARY

Aquatic – Pertaining to plants or animals that live in freshwater or marine environments.

Arctic – The Arctic is a geographic region that is circumpolar in extent and generally characterized as being north of the treeline, in an area of continuous permafrost.

Benthic – Pertaining to the bottom region of a water body, such as a lake.

Benthic invertebrates / Benthos – Assemblage of organisms living in or on the bottom sediment of a water body and dependent upon the decomposition cycle for most, if not all, of their food supply.

Biomass – The total mass of living organisms usually expressed as a weight per unit area or volume (e.g., mg/m^3 of water).

Bivalves – Mollusks with shells consisting of two halves (i.e., valves) such as clams.

Chironomids – Midges (two-winged insects) in the order Diptera. The aquatic larval form of this insect is typically the most abundant and diverse group of insects found in lakes.

Density of organisms – A term that describes abundance. The total number of living organisms expressed per unit area (e.g., $no./m^2$) or volume ($\#/m^3$).

Dissolved concentrations (water) – The concentration of chemical parameters in water filtered through a 0.45µm glass fiber filter. This is operationally defined as the dissolved fraction in water.

Dipteran insects – Insects of the Order Diptera, consisting of flies having two-wings that includes chironomids, flies, and mosquitoes.

Diversity – A measure (e.g., Shannon-Weaver index) of the variety of living organisms in an area (e.g., number or richness of species).

Drainage basin – The term given to a geographic area that contributes surface and groundwater to a particular lake, river, or stream (also see watershed).

Ecosystem – A community of interacting organisms considered together with the chemical and physical factors that make up their environment.

Environment – Components of the earth including land, water, air, and all layers of the atmosphere. Also included are organic and inorganic matter, living organisms, and all interacting natural systems.

Food chain – Organisms that are linked together in a series that, by consuming lower level organisms, transfer nutrients and energy from one group to another.

Food web – The concept used to describe the relationships of organisms within an ecosystem that are interconnected through various feeding linkages, resulting in the transfer of nutrients and energy.

Freshet – The increased flow of water over a relatively short period of time, usually during spring, caused by snowmelt.

Global Positioning System (GPS) – A sophisticated system used to define a precise geographic location with the aid of a satellite system. Units are typically expressed as UTM (Universal Transverse Mercator) or in latitude and longitude.

Habitat – Any area that provides food, water and/or shelter for an organism.

Invertebrates – A collective term for all animals without a backbone or spinal column and includes all aquatic animal organisms except fish.

Larva – The immature stage, between egg and pupa, of an insect with complete metamorphosis. Many insect larvae are aquatic, including chironomids, mayflies, stoneflies and caddisflies.

Limnology – The study of freshwater lakes including biological, geological, physical, and chemical aspects.

Littoral – The region of a lake, including water and sediment, from the surface to a depth at which photosynthesis ceases, usually within the upper 10m of the water column.

Meromictic – A permanently stratified lake, usually without oxygen (or fish) in its deeper portions due to a density gradient and lack of turnover.

Micro (μ) – A unit of measurement denoting a factor of one-millionth, such as μg/g.

Milligram (mg) – A unit of measurement denoting a factor of one-thousandth, such as mg/g.

Mixolimnion – The low-density surface layer above the pycnocline in a meromictic layer.

Monimolimnion – The high-density bottom layer below the pycnocline in a meromictic lake.

Nutrient – Any substance that provides essential nourishment for the maintenance of life (e.g., carbon, nitrogen, and phosphorous).

Oligochaete – True worms from the Phylum Annelida (segmented worms) that are common in sediment of freshwater habitats.

Oligotrophic – Nutrient deficient waters with low productivity. The vast majority of Arctic lakes are oligotrophic.

Organic Carbon (sediments) – The non-mineral fraction of the sediments that consists of organic carbon, expressed as a percent (%) of the total weight of sediment. This includes all forms of carbon except carbonates.

Phytoplankton – Microscopic or small floating plants suspended in the water column of aquatic ecosystems.

Planktonic – Referring to organisms with limited mobility that are free-floating and living in the water column.

Predator – Any organism that consumes another organism.

Prey – Any organism that is consumed by another organism.

Primary consumers – Organisms such as zooplankton that feed on primary producers (e.g., phytoplankton) for their source of nutrients and energy.

Primary production – Production by photosynthetic organisms, such as algae, phytoplankton and periphyton. Photosynthetic organisms comprise the bottom of the food chain.

Primary productivity – A term given to the rate at which new biomass (i.e., plant tissue) is generated by photosynthetic organisms (i.e., plants) using energy captured from the sun.

Pycnocline – The term given to the density layer of rapid change in temperature and salinity that separates the surface water (epilimnion) from the bottom water (hypolimnion).

Quality Assurance / Quality Control [QA/QC] – Sampling and analytical procedures (such as lab replicate sample analysis) that are integrated in field collection and analytical procedures to ensure acceptable data quality.

Richness – The number of unique taxa (e.g., species) found at a particular location.

Secondary productivity – The rate of increase in biomass of organisms that consume plants or other primary producers.

Secondary consumer – Organisms such as forage fish that consume primary consumers (e.g., zooplankton) for their source of nutrients and energy.

Sediment grain size – Refers to the size and relative size distribution of the particles that make up the sediment. Typically they are divided into four groups including clay, silt, sand and gravel.

Stratification – Vertical differences in water temperature, causing a density difference between warm, less dense surface water and cold, more dense bottom water, retarding or preventing mixing of surface and bottom water.

Terrestrial – Pertaining to plants or animals that live on land.

Total metals concentrations (water) – The total concentration of a metal in the water, which includes both freely dissolved and particle-bound forms of the metal.

Total Suspended Solids [TSS] – The weight of solids that are suspended in a given volume of water, expressed as weight per unit volume (e.g., mg/L).

Trophic Levels – A functional classification of organisms in an ecosystem according to feeding relationships, from primary producers through primary consumers, through secondary consumers.

Tundra – Habitat typically found in the Arctic north of the treeline that is adapted to cold temperatures, a short growing season, and low precipitation. Typical tundra vegetation includes moss, lichen, Labrador tea, and small shrubs.

Turbidity – A condition of reduced transparency in water caused by suspended colloidal or particulate material; measured by a turbidimeter and recorded as nephelometric turbidity units (NTU).

Ultra-oligotrophic – Lakes with extremely low nutrient levels, high water clarity, low primary productivity, and a dominance of small unicellular phytoplankton species. Total phosphorous concentrations are typically <0.005ug/L in these lakes (Vollenweider 1968).

Watershed – An entire geographic area that contributes surface and groundwater to a particular lake, river, or stream.

Water Quality Guidelines – Reference concentrations of contaminants in water that, if exceeded, indicates that organism-level effects may occur.

Zooplankton – Small, floating or weakly swimming animals found in fresh and marine waters, such as copepods and cladocerans.

EXECUTIVE SUMMARY

The objective of this study was to determine the limnology and ecology of Garrow Lake and assess changes to the lake after more than 20 years of tailings disposal. Prior to mining, the lake supported a depauperate biological community including a small, dwarf population of landlocked fourhorn sculpin (*Myoxocephalus quadricornis*). Teck Cominco has regularly monitored lake water quality and stratification since pre-mine investigations. However, no study of sediment quality or biological studies have been conducted since disposal of tailings to the lake began in 1980. As part of a 2002 DFO habitat authorization (02-HCAA-000-000063), Teck Cominco was specifically required to determine TSS and turbidity in different strata of Garrow Lake, metals concentration in littoral zone sediment and whole-body metal concentration in fourhorn sculpin.

Teck Cominco Ltd.'s Polaris Mine (75^{o}23'N 96^{o}50'W) on southern Little Cornwallis Island, Nunavut used Garrow Lake for tailings disposal pursuant to its designation as a Tailings Impoundment Area (*Fisheries Act* Schedule 2). as a Tailings Impoundment Area (*Fisheries Act* Schedule 2). Underground zinc-lead mining permanently ceased in September 2002. Since then the mine has undergone reclamation and decommissioning that concluded in fall 2004. Polaris Mine is undergoing a full cycle of Environmental Effects Monitoring (EEM) under the federal Metal Mining Effluent Regulations that will conclude in 2005.

Garrow Lake is small, ultra-oligotrophic, permanently chemically and thermally stratified (i.e., meromictic) lake with a surface area of 4.18 km^2, maximum depth of 42 m and a depauperate biological community. Prior to tailings deposition, the biologically active mixolimnion ranged between zero and 12 m – 14 m in depth and was well oxygenated, cold and brackish (3 – 7 ppt salinity). The deep monimolimnion extended from about 18 m to the bottom and was unusually warm (8^{o}C), completely anoxic, sulphide rich and hypersaline, with a salinity of up to 90 ppt. These layers were separated by a 6 m thick pycnocline where temperature increased, oxygen concentrations fell and salinity increased rapidly with increasing depth.

Between 1981 and 2002, approximately 15 million tonnes of tailings solids were deposited into the monimnolimnion. Gradual displacement of water upwards has reduced total depth of the lake from 46 m to 42 m, and reduced depth of the mixolimnion and thickness of the pycnocline. Discharge of tailings into the monimolimnion has also reduced mean salinity, from 90 ppt to 70 ppt, and caused complete mixing within the monimolimnion, such that temperature and salinity profiles are uniform from just beneath the pycnocline to the bottom.

Tailings deposition has not changed limnological conditions of the mixolimnion. Winter and summer water temperatures remain cold, ranging from –0.5 ^{o}C to 4 ^{o}C with little difference between seasons. Salinity ranged from 3.8 ppt at the surface to 7.1 ppt at the

pycnocline (9 m) with slight inverse stratification. Oxygen concentration was stratified and high in winter (13 – 20 mg/L) and supersaturated, a condition also noted during pre-mine conditions, presumably from algae and photosynthetic bacteria. In August oxygen was uniform at 11.5 mg/L, but was not supersaturated because absence of ice cover and mixing by wind, allowing oxygen to escape to the atmosphere.

Depth of the mixolimnion extends to 9 m at the top of the pycnocline. Maximum salinity is reached at the top of the monimolimnion at 12 m, a depth of only 3 m. Formerly, mixolimnion depth extended to 12 m and the bottom of the pycnocline ended at about 20 m. Oxygen concentration in the monimolimnion was nil and there was a strong hydrogen sulphide odor to the water.

Tailings deposition has displaced the mixolimnion depth by 4 – 5 m. Lake elevation in 2003 was 2 m higher than pre-mine elevation because of the dam that was still in place at the lake outlet. Removal of the dam in spring 2004 has allowed water level in the lake to return to near pre-dam elevations and will have reduced lake level and total depth of the mixolimnion to about 8 m, a further reduction of 2 m.

Prior to tailings deposition, sediment metals concentrations did not differ with depth and were relatively low, but reflected natural mineralization of the area, with elevated lead and zinc. A pipeline break in 1984/1985 caused tailings to spill into the littoral zone along the western shore of the lake, resulting in widespread contamination of lead and zinc in littoral zone sediment. This caused an increase in dissolved zinc concentration in surface waters of Garrow Lake and the outflow creek. Currently, zinc concentration in the Garrow Lake mixolimnion averages about 0.22 ppm, below the permit limit of 0.5 ppm established in 1992.

The only species of zooplankton known to be present in Garrow Lake is *Limnocalanus macrurus*, which was captured during pre-mine surveys. Amphipods (*Gammarus* sp.) and a mysid species (*Mysis oculata*) were also present in Garrow Lake prior to mining. No zooplankton species were captured during the 2003 survey. It is not known why zooplankton appeared to be absent. It is possible zooplankters were deeper in the water column than was sampled, or that changes to mixolimnion water chemistry may have caused a decline or extirpation of *L. macrurus* or its primary food source, phytoplankton. Phytoplankton were not collected in 2003.

Oligochaetes (F. Enchytraidae), nematodes and Foraminifera were the only benthic invertebrates identified in sediment collected at four stations within the mixolimnion zone in 2003. Although chironomid larvae were not collected from sediment, they were observed in stomachs of fourhorn sculpin. Pre-mining surveys also indicated a depauperate benthic fauna dominated by Foraminifera and a few harpacticoid copepods and chironomids. Garrow Creek sediment contained nematodes, oligochaetes a single mayfly (Ephemeroptera) species *Baetis bicaudatus* and several chironomid species.

All 19 sculpins captured in 2003 appeared to be healthy with no external or internal tumors, scars or other abnormalities. Mean length (149 mm), weight (25 g) and condition (0.70) of sculpins from 2003 were similar to sculpins collected in 1976 (155 mm, 26 g, 0.72) using the same gear. Length – frequency distributions of sculpins from 1976, 1977 and 2003 also demonstrated that the basic size distribution of adult sculpins has not changed over time.

Mean age of sculpins captured in 2003 was 5.7 years, with a range of 3 – 9 years. The small size, low lipid content (10%) and small size at age confirm that Garrow Lake sculpins are slow growing relative to other Arctic sculpin populations because of limitations in food and habitat.

Four of 11 sculpins stomachs examined contained food, with only a few chironomid larvae distinguishable. Pre-mine examination of stomachs indicated that half were empty while copepods, unidentified eggs, plant material, and a few amphipods were present in the other half. Copepods were not identified in stomachs in 2003, providing circumstantial evidence that zooplankton may not be abundant and comprise a very small component of the aquatic community in Garrow Lake post-mining.

Gonads of most sculpins examined appeared ripe or nearly ripe and these individuals would certainly spawn within the next few months during mid-winter, a trend that is consistent for this species.

Whole body concentration of manganese, lead (0.81 mg/kg ww) and zinc (72 mg/kg) in sculpins was higher in 2003 than prior to mining. Other metals including arsenic, cadmium, copper, mercury, and nickel were lower or did not differ among years. Elevated lead and zinc concentrations in sediment and the water column as a result of the spill may be responsible for elevated tissue concentration, however, the magnitude of increase in tissue was small, only 2 – 3 times higher than pre-mining concentration, despite a two-order of magnitude increase in lead and zinc concentration in sediment.

Overall, it appears as if the size, distribution, growth rate and reproductive status of the sculpin community has not changed markedly since pre-mining studies. Although catch-per-unit-effort was not recorded, sculpins were more difficult to capture and did not appear to be as abundant or as easy to capture as pre-mine surveys indicate. This may be related to the absence of zooplankton and reduced benthic habitat available to sculpins and their food sources because of gradual upward displacement of the mixolimnion. Nevertheless, sculpins have survived in Garrow Lake throughout the history of mining and tailings deposition to the lake, which is still designated as a tailings disposal facility.

Tailings introduction and upward displacement the pycnocline and mixolimnion will have reduced depth of the mixolimnion above the pycnocline to about 8 m in 2004, after removal of the dam. It has been determined that the magnitude of the thermal and salinity

difference between the mixolimnion and the monimolimnion in the lake will be sufficient to maintain separation of the two layers and prevent turnover and mixing.

1. INTRODUCTION

1.1. Background

Teck Cominco Metals Ltd.'s Polaris Mine (75°23'N 96°50'W) is situated on southern Little Cornwallis Island, Nunavut, in the high Arctic, approximately 90 km northwest of Resolute Bay (Figure 1). This region is characterized by short, cold summers and extremely cold, long and dark winters. Mean average air temperature is –17°C with an average of only 8 frost-free days annually. Precipitation is very low and is typical of desert conditions with only 25 cm of annual precipitation, most of this as snowfall. Winds are strong and predominantly from the northeast with an average wind speed of 20 kph (Gartner Lee, 2001).

Underground zinc-lead mining operations, which initially began in 1981, permanently ceased on September 3, 2002 with the final shipment of concentrate, taking place later that same month. The Polaris Mine has undergone a two-year reclamation and decommissioning phase (Garner Lee, 2001) that concluded in September 2004. In addition to remediation of upland soils, Polaris Mine is undergoing a full cycle of Environmental Effects Monitoring (EEM) under the federal Metal Mining Effluent Regulations (MMER; DFO, 2002). The MMER document (Azimuth Consulting Group, 2004) describes how the three main components of MMER are to be applied; routine effluent monitoring (chemistry, toxicity, mass loading) in Garrow Creek, emergency response, and Environmental Effects Monitoring (EEM) of receiving environment biota (benthic community and fish survey) in Garrow Bay.

As part of mine closure activities, Teck Cominco was required to undertake a basic ecological study of Garrow Lake as part of a Department of Fisheries and Oceans Habitat Authorization (see Section 1.4 and Appendix A). This document satisfies that directive.

1.2. Limnology

Garrow Lake is a small, permanently chemically and thermally stratified (i.e., meromictic) lake with a surface area of 4.18 km^2, a maximum depth of 46 m and unique limnological characteristics (BC Research, 1975; Ouellet and Dickman, 1984; Fallis et al., 1987). The lake is ultra-oligotrophic with very low nutrient concentration and a depauperate biological community (Fallis et al., 1987; BC Research, 1978). Because of its unique physical/chemical features, Garrow Lake has been the subject of much study, notwithstanding its designation as a Tailings Impoundment Area for Polaris Mine. Garrow is still considered a Tailings Impoundment under the current MMER (DFO, 2002).

The meromictic nature of Garrow Lake means that there are three distinct depth zones within the lake that never inter-mix, because of their particular thermal and chemical properties. These are the mixolimnion, pycnocline layer and monimolimnion, from top to bottom.

Prior to mining, the mixolimnion of Garrow Lake ranged from the surface to about 12 m – 14 m depth. It was well oxygenated, cold (0^{o}C to 4^{o}C) and brackish, ranging from 3 ppt at the surface to 7 ppt above the pycnocline. The monimolimnion ranged in depth from about 18 – 20 m to the bottom of the lake, at a maximum depth of 46 m. This deep layer was unusually warm (8^{o}C), completely anoxic, sulphide rich and hypersaline, with a salinity of up to 90 ppt, nearly triple the salinity of seawater. These two very different layers were separated by a pycnocline. The pycnocline represents the transition zone between the mixolimnion and monimolimnion where temperature increases, oxygen concentration falls and salinity increases rapidly with increasing depth. The large increase in density transitioning from the mixolimnion to the monimolimnion through the pycnocline is great enough to maintain complete separation of the layers and prevent mixing, even over thousands of years.

Garrow Lake is situated in an area of continuous permafrost and is ice-covered for much of the year (Photo 1). In some years, the ice does not completely melt, leaving an ice cover. The lake slopes steeply from the narrow littoral zone into the anoxic, hyper-saline profundal zone within tens of meters from shore. The drainage area of Garrow Lake is very small and is only double the surface area of the lake. The small drainage area and low precipitation means that total annual discharge from the lake via Garrow Creek is correspondingly small.

Discharge to Garrow Bay, 1.4 km south of the lake outlet occurs during the brief open water period from mid to late July through late-August or early September. In the nearly 3,000 years since its separation from adjacent marine waters, the annual freeze-thaw cycle at the lake's surface has transferred and concentrated salt in the deeper parts of the lake. Interestingly, bottom temperature is nearly 8^{o}C, much warmer than surface waters that are always near zero.

1.3. Mining Operations

Polaris was a zinc-lead mine that operated between 1981 and 2002 inclusive. Mined ore was crushed underground and moved by conveyor to a mill. Ore concentrate was stockpiled above ground in a covered building and shipped by ocean going bulk carrier to Europe during the brief open water period. Garrow Lake is a designated Tailings Disposal Facility. Over the life of the mine approximately 15 million tonnes of tailings solids were deposited to the bottom of Garrow Lake at a rate of up to 100 tonnes per hour (Gartner-Lee, 2001). Mill tailings were pumped via a 4 km long tailings line to a

thickener before being discharged to Garrow Lake via a submerged pipe. The pipe extended between 600 m and 1.2 km offshore and to a depth of 30 m (BC Research, 1988), at least 10 m below the pycnocline and 15 m above the bottom. The tailings line was moved every year to distribute tailings over the bottom. Small piles of tailings are apparent from lake bathymetry (Figure 2).

This disposal system was very effective, except for an incident in 1984/85 where a failure of the pipe resulted in tailings discharge into near-surface waters of Garrow Lake. This spill caused tailings to be deposited along the western shore of the lake near the tailings line and caused dissolved zinc concentration in surface waters to increase to more than 0.4 mg/L. Since the spill, zinc concentration in the mixolimnion has been slowly declining. Currently, zinc concentration in Garrow Lake averages about 0.23 ppm, below the permit limit (0.5 ppm) that was established in 1992.

To dilute zinc concentration in the mixolimnion and hence reduce zinc concentration in water discharged to Garrow Bay via Garrow Creek, Teck Cominco constructed a dam in 1989/1990 across the creek, about half way between the outlet and the mouth (Figure 2). Water was retained within the lake for three years, causing in increase in lake elevation and mixolimnion depth by about 2 m. Between 1994 and 2003 stream discharge and lake level was controlled by active siphoning of water over the dam into Garrow Creek between mid-July and early-September. Therefore, discharge was relatively constant throughout the discharge period, ranging between 0.19 m^3/s and 0.55 m^3/s, depending on the number of siphons in operation. The dike and siphons were removed in spring 2004 to allow the lake to return to its former level and in future, fluctuate naturally.

Prior to installation of the dam, flow in Garrow Creek was ephemeral with discharge typically occurring over a six to eight week period beginning in mid-July, once the stream mouth and channel had thawed. Stream flow began with melting and freshet, which lasts about two weeks (0.5 – 1.5 m^3/sec) before rapidly diminishing to relatively low discharge volume (0.1 m^3/sec) for the remainder of the summer/fall until freeze-up in early September. It is expected that since the dam and siphons have been removed, discharge will return to normal patterns, except with smaller discharge volume as no water is displaced by the addition of mine tailings.

1.4. Objective

Our objective was to describe the current limnology and ecology of Garrow Lake and assess changes after more than 20 years of use of Garrow as a tailings disposal facility. Prior to mining, the surface waters and littoral sediment of Garrow Lake supported a small community of zooplankton and benthos that sustained a small, dwarf population of landlocked fourhorn sculpin (*Myoxocephalus quadricornis*). It was not known if surface water conditions had deteriorated sufficiently as to cause unfavorable conditions for

aquatic life. Since pre-mine investigations in 1977 (BC Research, 1977), 1979 (Fallis et al. 1987) and 1980 (BC Research, 1981), very few studies on water quality have been conducted, outside of routine monitoring by Teck Cominco two or three times per year. No study of surface sediment quality (e.g., BC Research, 1988) or ecology of the lake has been conducted since deposition of mine tailings began. Therefore, as part of a 2002 DFO habitat authorization (02-HCAA-000-000063; Appendix A) during the decommissioning and dam removal process, Teck Cominco was specifically required to determine the following (see Section 4.0 of authorization; Appendix A):

- "TSS and turbidity in different strata of Garrow Lake to confirm the absence of contaminants in surface waters;
- metals concentration in sediment in the littoral zone of Garrow Lake; and
- whole-body metal concentration in fourhorn sculpin".

This report describes limnological and ecological features of Garrow Lake several months after cessation of more than 20 years of tailings disposal and satisfies requirements of the DFO Habitat Authorization. The data reported here extends beyond the requirements of the Habitat Authorization to review historical trends and provide a broader base of information.

2. MATERIALS AND METHODS

2.1. Limnology and Water Chemistry

Water sampling was conducted from a 3 m aluminum boat with 12 hp motor on August 8, 2003 (Photo's 2 and 3). Shifting ice pans covered at least 50% of the lake. One week earlier, ice cover on the lake was at least 80% (Photo 1). Based on historic bathymetric data and using a hand-held depth meter, the deepest depth on Garrow Lake that could be accessed because of ice, was located in 42.5 m of water (Figure 2). At this point, a vertical pH, temperature (^{o}C), oxygen (ppm), conductivity (mS) and salinity (ppt) profile of the lake was acquired using a Hydrolab^{TM} meter. Measurements were recorded at 1 m intervals between the surface and bottom. Vertical temperature and salinity profiles were compared with pre-mine profiles (BC Research, 1975; Fallis et al. 1987; BC Research, 1978) and during-mining profiles (BC Research, 1988) to determine the effects of mine tailings disposal on lake stratification, limnological parameters and water chemistry (Appendix B).

To acquire water samples for chemical analysis from this location (WQ-1), water was pumped from discrete depths using a direct pumping system. Depths were selected based on temperature and salinity data acquired with the Hydrolab. Weighted, ultra-clean metered Teflon tubing was deployed from the boat and lowered to the desired depth. A diaphragm pump was attached and water was pumped from depth for at least 1 minute before being discharged directly into sample collection bottles that were triple rinsed and held on ice. Water samples requiring filtering were filtered in the field by placing a 45 μm inline Gelman filter onto the end of the hose and discharging water directly into sample bottles.

Water was collected from the surface, mid-epilimnion (6 m), pycnocline (11 m) and hypolimnion layers (15 m and 30 m) to characterize each discrete layer. A 1-L plastic bottle with no preservative was used to hold water for determination of pH, conductivity, salinity, total suspended solids (TSS), alkalinity, sulphate and fluoride. A 250 ml glass amber bottle with no preservative was used to hold water for determination of DOC. Total metals and dissolved metals were collected in 250 mL plastic bottles preserved with nitric acid. Standard field collection and quality assurance/quality control (QA/QC) procedures were followed (BCMELP, 2003). Water samples were held on ice and during shipping to ALS Environmental Laboratory, Vancouver for analysis.

2.2. Sediment Chemistry

Sediment was collected from six littoral zone stations around the lake as ice conditions permitted using a 0.024 m^2 petite Ponar grab (Figure 2). Four stations were synoptically

sampled for sediment metals (GL-X-SED), benthos and zooplankton. Two stations (GL-N, GL-S) in the vicinity of the historic spill were only sampled for sediment metals. Stations were selected based on depth (<9 m) using a hand-held depth meter to ensure that sampling occurred within the mixolimnion layer of the lake to ensure consistency in grain size and avoid shallow depths with coarse substrate (Table 1).

Sediment was collected using proven sample collection and handling techniques (Environment Canada, 1994; BCMELP, 2003). Each deployed grab sample was examined to ensure acceptable sample quality (i.e., no large foreign objects; adequate penetration; not overfilled; no leaking water; no disturbance or winnowing). Once the grab sample quality was determined to be acceptable, overlying water was siphoned off and the top few cm of sediment was removed from the center of each grab using a pre-cleaned stainless steel spoon and placed in a pre-cleaned stainless steel mixing bowl. Two samples were acquired from each station and composited in the same bowl. Sediment was mixed using the spoon until it was homogenous in texture and colour. Aliquots of sediment were placed into 250-mL glass jars for analysis of total metals including mercury, total organic carbon (TOC) and grain size by ALS, Vancouver BC. Samples were stored in coolers with frozen gel packs on ice until analysis by the laboratory.

Total metals were analyzed using procedures from the BC Contaminated Sites Regulations (CSR) Analytical Method 8 *Strong Acid Leachable Metals (SALM) in Soil* and procedures adapted from *Test Methods for Evaluating Solid Waste SW-846* (US EPA Method 3050B or Method 3051). Sediment samples were manually homogenized, dried at 60 ^{o}C, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material was weighed. The sample was then digested at 90 ^{o}C for two hours by either hotplate or block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis was by atomic absorption/fluorescence spectrometry (CVAAS/CVAFS)(US EPA Method 7000 series) and/or inductively coupled plasma – optical emission spectrometry (US EPA Method 6010B).

2.3. Biota

2.3.1. Zooplankton

Vertical zooplankton tows were conducted from the four synoptic stations (Figure 2) using a 2 m long, 0.5 m diameter conical net, with 250 µm mesh size. The mouth of the net was lowered to a depth of 8 m and after waiting 30 sec, was towed vertically towards the lake surface. Two vertical tows were conducted and composited to determine zooplankton density (# organisms/m^3). Contents of the cod end were washed into a 500 mL HDPE jar and preserved with a 10% formalin solution. In addition, a horizontal tow was conducted at station 3. The net was weighted and towed behind the boat at a depth of

1 m for 3 minutes, to attempt to collect zooplankton for taxonomic analysis. Preserved samples were shipped to Applied Technical Services, Victoria BC for taxonomic identification.

2.3.2. Benthic Invertebrates

Sediment was acquired using a petite Ponar grab (0.024 m^2) at each of the four synoptic stations (Table 1). The top 5 cm of acceptable grabs was removed and sieved through a 500 μm sieve. Three grab samples were acquired at each station and composited (i.e., 0.072 m^2) to determine density of organisms (#/m^2).

Garrow Creek, just downstream from its outlet from Garrow Lake (i.e., below the dam) was sampled for benthic invertebrates using a kick-style sampler. Substrate upstream of a 250 μm net was disturbed, causing attached or burrowed organisms to drift into the net. This sampling was non-quantitative and was intended to determine species composition and relative abundance of benthic organisms in this ephemeral stream. Material retained by the sieve was transferred to a 500 mL HDPE container and preserved in a 10% buffered formalin solution. Preserved benthos samples were shipped to Applied Technical Services, Victoria BC for taxonomic identification and enumeration.

2.3.3. Fish

Pre-mining ecological surveys of Garrow Lake in 1976 (Fallis et al., 1987), 1977 (BC Research, 1987) and 1980 (BC Research, 1981) confirmed that Garrow Lake contained a glacial relict population of fourhorn sculpin (*Myoxocephalus quadricornis*). Since tailings deposition in Garrow Lake began in 1980, no sculpins have been collected from the lake, although divers have purportedly observed sculpins on an annual basis during maintenance and movement of the tailings line (W. Gzowski, Arctic Divers Ltd., August 2003). We collected sculpins in August 2003 using small-mesh (20 mm – 50 mm) Swedish gill nets and a baited prawn trap at various locations around the lake, as ice conditions permitted. Fallis et al. (1987) used similar size nets (19 – 64 mm stretch mesh) to catch sculpins in 1976.

All sculpins captured were measured for total length (mm), weight (g) and examined externally for any abnormalities. A subsample of sculpins were sacrificed and examined internally for gender, state of sexual maturity, stomach contents, parasites and internal condition and abnormalities. These sculpins were retained and frozen for subsequent whole-body analysis of metals concentration by ALS, Vancouver.

Length-frequency distribution, condition factor (K = length^3/weight x 10^5), sex ratio, maturity and diet from 2003 fish were compared with data collected from the pre-mining (1978 – 1979) period to determine changes in biology and life history characteristics.

3. RESULTS AND DISCUSSION

3.1. Limnology

3.1.1. Physical Attributes and History

Garrow Lake is one of the few meromictic (i.e., permanently stratified) lakes found in the Arctic and has the highest salinity content of all polar lakes (Ouellet et al., 1989). Strong vertical stratification due to large differences in salinity and temperature between the cold (~0^{o}C), slightly brackish (2 – 7 ppt salinity) mixolimnion and the warm (8^{o}C), anoxic, hypersaline, hydrogen sulphide rich monimolimnion maintains complete separation of these two discrete layers.

Garrow Lake was formed by isostatic rebound during the most recent Wisconsin glaciation period that ended 10,000 years ago. A marine depression was progressively uplifted, eventually isolating the marine water-filled depression from the surrounding ocean. Several independent estimates place the age of Garrow Lake (i.e., when it was physically separated from the marine environment) at between 2,500 and 3,500 years ago. ^{14}Carbon dating of marine bivalve shells collected near the shoreline elevation of Garrow Lake indicated a date of 3,350 years before present (BP). Isotopic examination of bottom water from Garrow Lake by Page et al. (1984) revealed that exposure of this water to air last took place at least 2,580 years ago. Using post-glacial rebound rates Thornsteinsson and Kerr (1968), Stewart and Platford (1986) and Fallis et al. (1987) independently estimated the age of Garrow Lake as 3,000, 2,600 and 2,500 – 3,000 years BP, respectively.

How the deep monimolimnion of Garrow Lake became to be nearly three times the salinity of sea water is a matter of some debate and several theories have been advanced to explain how this situation arose. Stuart and Platford (1986) favor the idea that brine currents were formed during the freeze-out of salts from surface waters that sank and, over time, accumulated to form the hypersaline monimolimnion. They contended that the ionic proportion and ratio between surface and deep waters was very similar and did not demonstrate the major differences that would necessarily occur if there was differential mineral precipitation in the monimolimnion or intrusion of hypersaline ground water from freeze-out. Furthermore, if freeze-out of salts beneath lakes was prevalent, this should be observed in many Arctic lakes, but it is not.

Alternatively, Ouellet and Dickman (1983) and Dickman and Ouellet (1987) hypothesized that after separation of Garrow Lake 3,000 years ago, gradually advancing permafrost froze out the freshwater, concentrating salts in deeper water of the lake over time. Ouellet et al. (1989) theorized that pore water trapped between sediment particles

would have been progressively frozen during isostatic rebound as Garrow Lake rose and "advanced" inland. The formation and presence of an unfrozen column of water or talik beneath Garrow Lake would favor the movement or displacement and gradual accumulation of frozen-out salts in the bottom of the lake. Based on their results and citing other similar studies on Antarctic lakes, Ouellet et al. (1989) concluded that cryogenic concentration of salts from surface waters or freeze-out of salts from surface soils over time were only of minor importance and refute the Stewart and Platford (1986) theory of major contribution by surface sources. This matter is still unresolved. A more thorough discussion of this can be found in the above papers and Fallis et al. (1987).

Fallis et al. (1987) and Ouellet et al. (1989) also offered an explanation as to why the monimolimnion is so warm relative to the mixolimnion. Lack of snow cover and clear ice allows light to penetrate through the mixolimnion and be absorbed by a bacterial layer within and just below the pycnocline boundary atop the monimnolimnion. The strong density difference between the surface and bottom layers does not allow mixing and allowed more heat to be absorbed within the deep layer than escapes. Over time, heat has been accumulated within the monimolimnion, eventually reaching an equilibrium temperature.

The chemical and thermal structure of the monimolimnion has been disturbed by the physical disturbance of tailings disposal into the mid-water column. Vertical mixing action within the monimolimnion caused by buoyant tailings water and tailings solids falling through the water column has gradually caused temperature and salinity profiles to become more uniform or homogeneous. This has also resulted in a less saline, slightly cooler and more uniformly mixed monimnolimnion than existed prior to mining (Figure 3; Appendix B).

3.1.2. pH, Temperature, Salinity and Oxygen

3.1.2.1. Pre-Mining Profiles

Pre-mining studies in 1976 and 1981 (Fallis et al., 1987), 1977 and 1980 (BC Research, 1978; 1981), and 1980 and 1981 (Dickman and Ouellet, 1987) recorded very similar vertical pH, temperature, oxygen and salinity profiles and stratification parameters in Garrow Lake. Studies conducted in 1982 (Stewart and Platford, 1986), and 1983 and 1984 (Ouellet and Dickman, 1987; Ouellet et al., 1989), shortly after commencement of mining, also reported similar results to pre-mining. In all studies, mixolimnion depth extended to about 12 m at which point temperature and salinity began to increase rapidly with increasing depth (the pycnocline) to reach a maximum at about 20 m, the top of the monimolimnion (Figure 3). This zone extended to the bottom of Garrow Lake at its deepest depth (46 m).

Water column pH typically ranged between 6.9 and 8.0 and tended to be slightly lower within the monimolimnion than in the mixolimnion (BC Research, 1977; Fallis et al., 1987).

Water temperature in the mixolimnion ranged between just above zero to four or five degrees Celsius, depending on the month (cold in June, warmer in August), and tended to gradually increase with depth towards the pycnocline (BC Research, 1978; Stewart and Platford, 1987; Ouellet et al., 1989). Wind mixing during open water conditions in late fall resulted in more uniform temperature between surface and deeper water of the mixolimnion (BC Research, 1978).

Oxygen concentration was always high, reflecting surface mixing in summer and biological activity by plankton in the mixolimnion. Fallis et al. (1987), Ouellet and Dickman (1987) and Stewart and Platford (1986) observed supersaturation (>100%) of normal oxygen solubility at deeper depths in the mixolimnion especially in spring. Supersaturation is believed to result from freezing-out of oxygen during ice formation and from biological productivity. A dense plate of photosynthetic bacteria exists just above the pycnocline (Fallis et al. 1987). During late winter and spring, these bacteria and phytoplankton produce an excess of oxygen that accumulates and is trapped in the water column beneath the ice cover.

Total suspended solids (TSS) concentration (mg/L) was measured in effluent from Garrow Lake, which represents concentrations found in the upper few meters of the mixolimnion. In all cases, TSS was less than detection limits (i.e., either 1 mg/L or 3 mg/L, depending on the laboratory). Visual observations of the lake from water sampling throughout the water column confirmed that there was no visible turbidity to the water, regardless of depth.

Salinity of the mixolimnion varied between slightly brackish at the surface to about 7 or 8 ppt in all studies showing slight vertical stratification (Table 2; Figure 2). Salinity in the upper water column is lower in summer and fall than in winter because of dilution by ice melt. Anion and cation concentrations and conductivity mirrored salinity and increased proportionately with depth (Ouellet et al., 1989). In January 1983, two years after commencement of tailings disposal, salinity of the mixolimnion was 4.8 ppt and did not differ from pre-mine conditions. Sampling of the water column beneath the ice in June 1984, three years after discharge of tailings, revealed dilute surface water salinity (0.5 ppt at 1 m) with uniform salinity to 12 m (5.7 ppt)(Ouellet et al. 1989).

Within the top of the pycnocline (12 – 14 m) oxygen concentration diminished while temperature and salinity increased with increasing depth. All researchers observed this trend. At the bottom of the pycnocline (18 m – 20 m), oxygen had diminished to zero while temperature had increased to 9^{o}C in the upper monimolimnion. The bacterial plate near the bottom of the pycnocline observed by BC Research (1980) and Ouellet and

Dickman (1983) is likely responsible for increased turbidity at this depth as well as increased hydrogen sulphide concentration, which continued to increase with increasing depth. Salinity increased very strongly between 12 m (9 ppt) and 20 m (66 ppt)(Stewart and Platford, 1986; Fallis et al, 1987). Ouellet et al. (1989) also observed that salinity increased rapidly with increasing depth through the pycnocline from 5.7 ppt at 12 m to 35.2 ppt at 17 m and 76.7 ppt at 21 m. Stewart and Platform (1986) and Fallis et al. (1987) observed similar salinities at the same depths.

Within the monimolimnion extending from 20 m to the lake bottom, oxygen concentration was nil and water temperature decreased very gradually from 9^{o}C to 5^{o}C and did not differ among seasons or years (BC Research, 1977; 1981; Stewart and Platford, 1986; Fallis et al., 1987; Ouellet et al., 1989). Salinity also gradually increased with depth, reaching maximum salinity (between 80 and 90 ppt depending on the study) at the lake bottom (46 m). Because of the isolated, undisturbed nature of the monimolimnion prior to mining, temperature and salinity profiles were virtually identical among studies, regardless of season or year.

3.1.2.2. Post-Mining Profiles

BC Research (1988) analysed surveillance water quality data from Garrow Lake between 1982 and 1987 to evaluate changes in metals concentrations within the different layers during the period of discharge of mine tailings to the monimolimnion. Vertical temperature and conductivity profiles were essentially unchanged except for the fact that the salinity gradient within the monimolimnion was steeper, suggesting that stratification within this layer was disturbed. As expected, continuous discharge of tailings to 30 m depth, 12 m above the bottom, was causing vertical mixing within the monimolimnion beneath the pycnocline, resulting in more uniform salinity and temperature profile and raising metals concentrations. Teck Cominco continued to collect vertical temperature and salinity profiles of Garrow Lake during winter and summer periods to monitor the limnology of the lake in order to ensure that the integrity of the pycnocline was maintained and that mixing of the monimolimnion into surface water was not occurring.

In 2003, Garrow Lake was completely ice-covered until late-July. During mid- to late-August, the lake became mostly ice-free, although ice pans persisted over about 20% of the lake and shifted around according to wind direction. In 2004, the lake remained completely ice-covered and sampling was not possible. Effective mixing of surface waters is only possible during ice-free conditions when sufficient surface area of the lake is exposed to wind to cause turn-over and vertical mixing.

Teck Cominco staff sampled water during February and March 2003 from a single location near the middle of the lake. In August, we collected a single vertical profile from the lake from the deepest accessible location (42.5 m), GL-1-WQ (Figure 2). Winter and

summer vertical profiles of temperature, oxygen and salinity were very similar to pre-mining data (Figure 3) with two notable differences. Salinity of the monimolimnion and depth of the mixolimnion have both diminished, reflecting the physical effects of tailings deposition to the lake bottom.

Mixolimnion salinity ranged from 3.8 ppt (6.7 mS) at the surface to 7.1 ppt (12.5 mS) at the top of the pycnocline (9 m). Melting ice caused lower salinity and conductivity at the surface than at deeper depths, with a slight inverse stratification. In winter 2003, salinity and conductivity within the epilimnion was uniform (Appendix B). Oxygen concentration was stratified and high in winter (13 – 20 mg/L) and supersaturated, a condition also noted during pre-mine conditions, presumably from photosynthetic bacteria. In August oxygen was also high and uniform (11.5 mg/L), but was not supersaturated because absence of ice cover and mixing by wind allowed oxygen to escape to the atmosphere (Figure 3).

Winter and summer water temperatures were cold, ranging from –0.5 ^{o}C to 4 ^{o}C with very little difference between seasons. Surface water temperature (<2 m) was slightly warmer in summer than in winter. Below 2 m depth, water temperature ranged between 3^{o} and 4^{o}C. Field pH was 8.2 in the mixolimnion and declined through the pycnocline and monimolimnion to 7.35 that was unchanged with depth to the bottom (Appendix B). Limnological conditions within the mixolimnion were very similar in 2003 as pre-mining conditions and do not appear to have changed substantially.

Pycnocline depth below the surface is shallower and has become thinner compared to pre-mining profiles (BC Research, 1981; Fallis et al., 1987; Ouellet et al., 1989). The depth of the surface of the pycnocline, where large, rapid salinity increases occurred in 2003 was at 10 m, reaching near maximum salinity of the monimolimnion by 12 m, a thickness of only 2 m. Formerly, mixolimnion depth extended to 12 m and the bottom of the pycnocline ended at about 20 m. Salinity of the monimolimnion (field based Hydrolab data) was 58 ppt (Appendix B; Figure 3), which is about 32 ppt less than maximum salinity observed in pre-mining studies. Laboratory analysis of mixolimnion water showed a maximum salinity of 64 ppt. Nevertheless, salinity has diminished gradually over time as expected (AXYS, 2001) owing to the large amount of tailings deposited to the lake over more than 20 years, diluting bottom waters. Oxygen concentration was nil and there was a strong hydrogen sulphide odor to the water.

Tailings deposition between 1981 and 2002 has displaced the mixolimnion upwards and is 3 – 4 m shallower than pre-mining, beginning at 9 m, up from the pre-mine depth of about 12.5 m. However, lake elevation in 2003 was also about 2 m higher than pre-mine elevation because of the dam structure that was still in place at the lake outlet (Figure 2). The dam was installed in 1990 to increase water level of the lake to reduce zinc concentration in water discharged to Garrow Bay (see Section 1.3). Removal of the dam in spring 2004 will allow water level in the lake to return to near pre-dam elevations and

will reduce lake level and depth of the mixolimnion by a further 2 m, beginning at a depth of approximately 7 or 8 m.

In 2000, Teck Cominco commissioned AXYS (2001) to determine if diminishing mixolimnion depth would risk turnover and mixing of the mixolimnion and monimolimnion. If this occurred, water chemistry of the entire lake and Garrow Creek would be considerably altered. AXYS (2001) concluded that the density barrier of the pycnocline is strong enough that it cannot be broken down or compromised by wind and wave action after decommissioning of the dam and lake drawdown. Thus, no mixing of the mixolimnion and monimolimnion is possible. Furthermore, AXYS (2001) stated that zinc concentration in the mixolimnion will remain below 300 µg/L and that levels should decline over time, however, no time frame was given.

3.1.3. Metals

Between 1980 and 2002 approximately 15 million tonnes of tailings solids were deposited to the monimolimnion of Garrow Lake (Gartner-Lee, 2001). Tailings were discharged via a pipe suspended in the water column, well below the pycnocline at a depth of about 26 – 31 m. The location of the pipe was moved horizontally and laterally on an annual basis, to distribute tailings more evenly over the bottom. Small, discrete piles of tailings are evident from the bathymetric map of Garrow Lake (Figure 2). These piles are spread out over the deep basin opposite the tailings disposal line. Maximum depth of Garrow Lake has diminished to about 42 m, which is approximately equivalent to the depth that the mixolimnion has been displaced upwards.

Prior to mining, it was believed that discharging tailings to the monimolimnion of Garrow Lake would prevent dissolved metals from diffusing upwards through the pycnocline and into the mixolimnion. The high density of the pycnocline presents a physical barrier, while the abundance of sulphides would bind and scavenge metals from the water column and act as a chemical barrier. The tailings disposal system has been effective at preventing upward migration of metals. However, as discussed below, three spills of tailings into surface waters has been responsible for elevated metal concentrations in the mixolimnion.

In winter 1981 the tailings pipe became clogged and resulted in a small tailings spill on the ice surface near the northwest corner of the lake (Dickman and Ouellet, 1987). This material was deposited into nearshore water and may have contributed to elevated metal concentrations in surface waters. A more substantive spill occurred in the winter of 1984 – 1985. At that time, the down-leg section of the pipe broke at about 0.6 m depth and discharged a considerable amount of thickened tailings under the ice. The break was not detected for about three months until results of water sampling indicated elevated zinc (150 µg/L) at 10 m depth. Repairs were made in February 1985.

The total amount of zinc spilled into the mixolimnion was estimated by BC Research (1988) to be in the order of 800 tonnes, based on a zinc content of 0.5%, assuming a discharge rate of tailings at 1,600 tonnes/day. They further estimated that 42.7 tonnes of zinc was dissolved in the upper 20 m of Garrow Lake. Another spill occurred in the winter of 1989 (Gartner Lee, 2001), however we could not determine how much tailings were spilled or at what location. In 1992, a submerged, double-walled pipe was installed to eliminate the possibility of future spills.

The tailings spill caused a minor increase in lead concentration and a large increase in zinc concentration within the mixolimnion from 10 µg/L (1977) to 230 µg/L (1987) (BC Research, 1988). The extent of surface contamination was not realized because zinc concentration in Garrow Creek continued to be relatively low (61 µg/L) in summer 1986. However, vertical mixing of water during summer and under-ice caused zinc trapped above the pycnocline to become mixed into the mixolimnion, causing zinc to increase from 170 µg/L to 280 µg/L throughout the upper water column. Sampling of the lake beneath the ice in January 1988 revealed a sharp increase in zinc concentration in the upper pycnocline at 11 and 12 m depth (BC Research, 1988) and an increase in the mixolimnion to 310 µg/L. At the time, it was not known if the pycnocline would continue to be a "reservoir" of dissolved zinc or if zinc would be precipitated by sulphides within the pycnocline, and removed from the active mixolimnion by settling. Dissolved lead concentration continued to be low and was likely precipitated by sulphides. BC Research (1988) speculated that upward displacement of the pycnocline would increase average and peak zinc concentrations discharged from Garrow Lake over time, threatening to exceed Teck Cominco's permitted discharge concentration of 100 µg/L. Ice melt usually sufficiently diluted discharge of surface water to Garrow Creek such that limits were not exceeded except perhaps during first or last weeks of discharge from the lake.

In 1990 AXYS (1991) measured dissolved zinc concentrations of 410 µg/L and 1,800 µg/L within the mixolimnion and pycnocline respectively. Concentrations of total and dissolved zinc were very similar, suggesting that precipitation and loss to the monimolimnion was not occurring. These concentrations exceeded the discharge permit concentration. Therefore, Teck Cominco constructed a small dam across the creek in 1990 and 1991 about half way between the lake outlet and the creek mouth at Garrow Bay. The purpose of the dam was to prevent zinc contaminated surface water from reaching Garrow Bay by allowing lake level to increase by about 2.5 m and 10 Mm^3 in volume over a period of three years, diluting the mixolimnion and allowing tailings contaminated particulates in the lake to settle.

Water was not discharged from Garrow Lake until spring of 1994. During the intervening period several studies were undertaken to examine the effects of lead and zinc on receiving environment biota in Garrow Bay (AXYS, 1991; EVS, 1992). Results of these studies suggested that harmful effects of elevated zinc concentration were unlikely.

Consequently, the discharge limit for zinc was increased to 500 µg/L in 1992 (AXYS, 2001). This concentration was not exceeded during the remainder of mine life.

Subsequent to 1994, until removal of the dam, siphons were used to discharge water over the dam that allowed control over timing and volume of release. Gartner Lee (2001) reported that zinc concentration in the mixolimnion of Garrow Lake had gradually diminished from 400 µg/L in 1990 to 280 µg/L in 1999 and 2000. In 2003, mixolimnion dissolved zinc concentration was 240 µg/L, similar to 2000 data (Table 3).

Sampling of the water column at discrete depths in 2003 (GL-WQ-1) revealed that total metals concentrations within the mixolimnion (2 m and 6 m), pycnocline (11 m) upper monimolimnion (15 m) and deep monimolimnion (31 m) did not differ in concentration with the exception of lead and zinc (Table 3). Lead was more than an order of magnitude higher in concentration in the monimolimnion (12.1 µg/L) than the mixolimnion (0.8 µg/L). Zinc was higher in the monimolimnion (338 µg/L) than in the mixolimnion (240 µg/L) and highest within the pycnocline (1,140 µg/L), a pattern that was also observed in 1988 (1,800 µg/L at 16 m; BC Research, 1988) and 1990 (1,820 µg/L at 13 m; AXYS, 1991)(Table 2). Cadmium, lead and copper concentrations were also highest in the pycnocline. These data suggest that the pycnocline is a barrier, preventing transfer of metals from the monimolimnion upwards, but it also may prevent sinking of metals. Bacteria near the bottom of the pycnocline may be partly responsible for maintaining elevated metals in water owing to accumulation of zinc within the bacterial tissue.

Pre-mining, mining and post-mining water column metals data within the mixolimnion, pycnocline and monimolimnion are compared in Table 3. Concentrations of most metals, including arsenic, cadmium and copper, did not appear to change with any discernable pattern over mine life. Arsenic concentrations were low in the mixolimnion and pycnocline and were one to two orders of magnitude higher in the monimolimnion. Cadmium concentration was uniformly low and near detection limits in most water samples. Copper data were variable and did not demonstrate any trend or pattern over time or within discrete layers. Lead concentration in the mixolimnion increased after the metals spill in 1985 and has remained somewhat elevated since then, but has diminished over time.

Only zinc has demonstrated consistent trends in concentration over time and within discrete layers in Garrow Lake. During tailings discharge, prior to the spill, zinc concentration in the mixolimnion was low, less than 24 µg/L (0.024 mg/L) (Fallis et al., 1987; BC Research, 1978). BC Research (1981) measured higher concentrations in 1980, although Dickman and Ouellet (1987) measured low concentrations (16 µg/L) in 1981, the same year that tailings discharge was initiated. Zinc concentration increased in the monimolimnion shortly after tailings disposal was initiated, reflecting the addition of zinc rich material dispersed into the mid-water column. Zinc concentration in the monimolimnion has consistently been measured between 200 and 300 µg/L since tailings

disposal began. Note that this concentration is still below the discharge limit in Garrow Creek of 500 µg/L and is only slightly higher than zinc concentration in the mixolimnion.

As discussed above, the tailings spill into surface waters of Garrow Lake has caused dissolved zinc concentration to become and remain elevated (~250 µg/L) in the mixolimnion and especially the pycnocline layer (1,140 µg/L). This concentration has remained consistent since the mid-1990s. Elevated concentrations of dissolved zinc will likely be maintained for some time due to high concentration in the pycnocline, but also by elevated zinc concentration in the sediment due to the spill in 1985. The widespread zinc contamination throughout nearshore, littoral zone sediment of the lake (see following section) may present an on-going source of dissolved zinc to the mixolimnion.

3.2. Sediment Chemistry

No study has examined sediment chemistry of Garrow Lake since deposition of mine tailings was initiated. This is because tailings were especially deposited into the monimolimnion, which has proven to be an effective barrier at preventing movement of metals upwards through the pycnocline into surface waters (see Section 3.1). Despite the tailing spill to shallow sediment in 1984/85, no survey of sediment chemistry was undertaken.

In 1976, prior to mining, Fallis et al. (1987) collected sediment from 9 stations around Garrow Lake from depths ranging between 3 m and 48 m (Table 4). Six stations were situated within littoral zone sediments in depths of 12 m or less, within the mixolimnion. Three stations were in depths of greater than 12 m within the pycnocline or monimolimnion, in the anoxic, lifeless (except bacteria) zone of the lake. BC Research (1978) collected sediment from only two stations (12 m and 19 m) in 1977 and from 19 stations in May (5) and August (14) in 1980 (BC Research, 1981) at depths ranging from 5 – 48 m.

Concentrations of most metals including lead (<0.25 – 11 mg/kg), zinc (30 – 103 mg/kg), cadmium (0.25 – 3.1 mg/kg), arsenic (4.2 – 11.4 mg/kg), copper (15 – 31 mg/kg) and manganese (59 – 209 mg/kg) did not differ markedly with depth, even between littoral zone (<12 m) and monimolimnion zone sediment. Metal concentrations were only slightly higher in the deepest part of the lake, otherwise there were no meaningful differences among depths or between different areas of the lake in both the BC Research (1978 and 1981) and Fallis et al. (1987) studies. Interestingly, Fallis et al. (1987) found that metal concentration tended to be positively correlated with grain size.

Unfortunately, several spills of tailings (1981, 1985/85, 1989) introduced metals contaminated material to littoral zone sediment. The substantive spill under the ice during the winter of 1984 – 1985 discharged approximately 800 tonnes of zinc in thickened

tailings (BC Research, 1988). No study was conducted to determine the spatial extent and magnitude of contamination until the present study. However, given the designation of Garrow Lake as a tailings disposal facility, this was not necessary.

We sampled surface sediments from between 6 and 8 m within the mixolimnion at four locations around the lake, as well as two locations within the area of the 1984/85 tailings spill along the western shore of the lake (Figure 2). Grain size was predominantly silty-clay at all stations with a very fine, flocculent, oxidized surface layer with some organics, over grey colored sediment of uniform color, consistency and appearance (Table 1). With the exception of lead and zinc, sediment metal concentration throughout the littoral zone was no more than double pre-mining metal concentration (Table 5). Mean lead (137 µg/g dw) and zinc (742 µg/g dw) concentrations in littoral sediments from around the lake however, were considerably higher than pre-mine concentrations (0.25 µg/g and 61 µg/g dw respectively; Fallis et al., 1987) and are a reflection of the spill.

Given that sampling of sediment was conducted at similar depths over most of the lake that was accessible by boat (ice conditions permitting), these data indicate that the spill of metal contaminated tailings resulted in lake-wide contamination of surface sediment. Lead and zinc concentrations were only slightly higher at GL-2, nearest the historic spill area, than at the other three littoral stations. Suspended sediment introduced into the water column during the spill settled throughout most of the lake, causing contamination of surface (at least upper 1 – 2 cm) sediment in the littoral zone.

Two sediment samples collected from the immediate vicinity of the historic spill area had similar or lower concentrations for several metals (aluminum, barium, chromium, mercury, molybdenum, nickel, strontium) than littoral sediment and higher concentrations of lead (1,000 µg/g dw) and zinc (7360 µg/g dw)(Table 5). Most other metals for which pre-mine data were available are not substantially elevated or are lower than pre-mining concentrations.

3.3. Ecology

3.3.1. Zooplankton

No true zooplankton species were captured during the 2003 survey from the vertical tows at each of the four sediment stations (Figure 2), nor from a horizontal tow, conducted <1 m below the water surface. However, a single oligochaete worm and at least one cyclopoid copepod of benthic origin were sampled from each station.

Limnocalanus macrurus is the only species of zooplankton known to be present in Garrow Lake. This species was identified in 1976 by Fallis et al. (1987) and in 1977 and 1980 by BC Research (1978 and 1981 respectively). *L. macrurus* is a relatively common

species in the Arctic and is also present in many large, deep freshwater lakes. *L. macrurus* is known as a glacial relict species (Pennack, 1978). BC Research (1978) also captured or observed amphipods (*Gammarus* sp.) and a mysid species (*Mysis oculata*). Apparently, mysids were relatively abundant and of a large size, based on observations made during SCUBA surveys of Garrow Lake by BC Research (1978). Each of these species was also observed in nearby Frustration Lake in 1977 beach seines (BC Research, 1978).

In 1980, BC Research (1981) determined the density of plankton in vertical hauls from different depths (10 m, 15 m and 19 m, just above the pycnocline) and found that abundance of *L. macrurus* was much greater at the deepest depth, corresponding with the depth where the greatest abundance of phytoplankton was found.

It is not known why zooplankton were apparently absent from the lake during the present survey. Abundance of zooplankters is normally low in oligotrophic Arctic lakes, however, if plankton were present, at least a few individuals should have been captured. Perhaps plankton were situated at a deeper depth than was sampled in 2003 (8 m), or the mesh size used in the current study (250 µm) was too large; Fallis et al. (1987) used a 73 µm net. However, adult zooplankters of this species reach 2 mm in length (Pennack, 1978) so this may not explain their absence.

It is also possible that changes in water quality of the mixolimnion since pre-mine surveys have diminished abundance of the primary food source of *L. macrurus*, phytoplankton, or has directly affected zooplankton abundance. Phytoplankton were not collected during the 2003 survey.

3.3.2. Benthic Invertebrates

Oligochaete worms of the Family Enchytraidae, nematodes and Foraminifera were the only benthic invertebrates retained on a 250 µm sieve from petite ponar sampling in Garrow Lake in 2003 (Table 6). Abundance and density of oligochaetes was reasonably good, however, diversity of species was low. Chironomid larvae were present in the lake because several larvae were collected from the stomachs of fourhorn sculpin (see Section 3.3.3). However, density of chironomids in the lake appears to be quite low because none were collected from sieving of sediment. Given the high northern latitude and brief open water period, abundance of flying insects is naturally very low in this region. In fact, few flying insects were observed, with no mosquitoes or blackflies, which was a blessing.

Nematodes and Foraminifera were not included in the density estimate because these organisms are smaller than the mesh size used (250 µm) although they can be retained in small numbers. Nematodes and Foraminifera are very abundant and widespread in all lakes and their density is very infrequently estimated.

Fallis et al. (1987) also found a depauperate benthic fauna in Garrow Lake, dominated by Foraminifera. They identified 19 species with *Protelphidium orbiculare* being most abundant, followed by *Elphidium translucens*, *Ammotium cassis* and *Trochamina rotaliformis*. A single mollusk species, *Astarte warhami*, and an unidentified harpacticoid copepod were the only other species identified. Fossils of polychaetes, echinoderms and ostracods were identified in sediments, probably species that had been weathered out of historic, marine sediments as the lake has risen since the most recent glaciation.

BC Research (1978) identified nematodes, oligochaetes and harpacticoid copepods from Garrow Lake, although their abundance was not determined.

Garrow Creek sediment contained nematodes, oligochaetes a single mayfly (Ephemeroptera) species *Baetis bicaudatus* and several chironomid species (Table 6). These data indicate that, despite the ephemeral flow of the creek, it is capable of supporting aquatic life, dominated by oligochaetes. Chironomids were present in low abundance and their presence confirms that these organisms are capable of surviving in the creek and therefore, presumably Garrow Lake.

3.3.3. Fish

Nineteen fourhorn sculpins (*M. quadricornis*) were captured in gill nets and a prawn trap from Garrow Lake in 2003 (Table 7). Eleven sculpins were sacrificed to determine gender, sexual maturity, gut contents, age (using otoliths), internal condition and tissue metals concentration (whole fish). All 19 fish were measured for total length and weight to determine condition factor (Table 8) and length-weight relationship (Table 9).

Fallis et al. (1987) and BC Research (1978, 1980) were the first investigators to document sculpin biology (length, weight, growth, age, metals) prior to mining. No biological study of the sculpin population of Garrow Lake had been conducted until the present investigation. So, comparisons made here represent data collected prior to mining and after mining had ceased.

3.3.3.1. Size

All sculpins captured in 2003 appeared to be healthy with no external or internal tumors (Photo's 4 and 5), scars or other abnormalities (Table 7). Sculpins ranged from 85 mm to 184 mm (mean 149 mm) in length and 4.2 g to 40.3 g (mean 24.9 g) in weight. Mean condition factor (K) was 0.70 (Table 8). Fallis et al. (1987) captured 51 sculpins in 1976 using small-mesh, Swedish style gill nets, similar in size to the nets used in the current survey. All fish were acquired from above the pycnocline and none were found below 15 m. BC Research (1978) captured 137 sculpins using beach seines and observed that sculpins were found throughout the lake and appeared to be abundant and easily captured. Sculpins continued to be observed in the lake throughout the period of mining during

SCUBA maintenance of the tailings line (Gartner Lee, 2001; W. Gzowski, Arctic Divers Ltd., Yellowknife NWT personal communication, May 5, 2003), although no biological study was conducted.

Meristic data from 2003 were very similar to mean length (155 mm), weight (26.6 g) and condition factor (0.72) of sculpins captured by Fallis et al. (1987) using the same fishing gear (Table 8) prior to mining. Fish captured by BC Research (1978) in beach seines and nets had a wider size distribution (20 – 170 mm) and had a lower mean weight and condition factor.

Length – frequency distributions of sculpins from 1976 (Fallis et al. 1987), 1977 (BC Research, 1978) and 2003 demonstrate that the basic size distribution of adult sculpins has not changed markedly (Figure 4) since prior to mining. The maximum size of fish captured in 1976 was greater than in 2003, however, this is likely due to the small number of fish captured in 2003. Small, juvenile fish were collected, indicating that successful reproduction of fish had occurred and that recruitment of small fish into the population was occurring. Unfortunately, seining was not conducted, so many of the small fish captured in 1977 by BC Research (1978) were not represented here.

Length-weight relationships derived for each year (Table 9) were also quite similar suggesting that growth of sculpins, based on weight at length, has not changed since mining began. The 1976 data are most relevant to 2003 because similar fishing gear was used. Sculpins captured in 2003 (modal length of 155 mm) may have been slightly smaller than in 1976 (modal length of 175 mm). However, given the similarity in mean size and condition of fish caught in 1976 as in 2003 (Figure 4), suggests that the current size, size distribution and health of sculpins is similar to pre-mining conditions (Fallis et al. 1987).

3.3.3.2. Age

Mean age of sculpins captured in 2003 was 5.7 years, with a range of 3 – 9 years (Table 7). Fallis et al. (1987) and BC Research (1977) did not age sculpins. However, the small size, low lipid content (10%) and small size at age confirm that the sculpin population of Garrow Lake is very slow growing. Fallis et al. (1987) also stated that Garrow Lake sculpin have very slow growth rates relative to other Arctic sculpin populations (Bohn and Fallis, 1978), because of limited food as well as habitat. The deep, circular shape of the lake basin and the anoxic monimolimnion prevents sculpins from existing beneath the pycnocline, thus limiting benthic habitat for sculpins to littoral zone sediments. Given that 2 m of this shoreline habitat is eliminated during winter by ice, available habitat for food production is very limited indeed. The lack of food and cold water temperature explain their small size and slow growth rate relative to fish age.

3.3.3.3. Diet

Stomachs of 7 of 11 sculpins were empty. Of the four stomachs containing food, only a few chironomid larvae were distinguishable, as well as some unidentifiable plant matter and algae (Table 7). The presence of chironomids confirms that they do exist in Garrow Lake, despite the fact that chironomids were not identified from benthic grabs. This suggests that benthic productivity is very limited and even during the "height of summer" there is little food to be had.

Fallis et al. (1987) examined 27 sculpin stomachs of which half (14) were empty. Stomach contents included unidentified eggs, plant material, copepods and a few amphipods. BC Research (1977) found that the copepod *L. macrurus* dominated the diet. We did not identify copepods in the water column or in stomachs, suggesting that this species no longer comprises a significant portion of the sculpin diet. If the zooplankton community has diminished in Garrow Lake, and sculpins have been forced to become strictly dependent on benthic food sources, their population abundance would be expected to have declined. Although catch-per-unit-effort statistics were not recorded, Fallis et al. (1987) captured 51 sculpins in three net sets of 24 h each. The 2003 survey captured only 8 sculpins using gillnets over three days, with a baited prawn trap responsible for the remaining catch. Sculpins seemed to be more difficult to catch in 2003 and therefore may be less abundant than prior to mining (Fallis et al. 1987; BC Research, 1978). Given the lesser amount of habitat available to the population because of the reduced size of the mixolimnion, this result is not surprising.

3.3.3.4. Sex and Maturity

Sex ratio of sculpins captured in 2003 was split evenly between males and females and all fish autopsied appeared sexually mature, with nearly ripe gonads. Fallis et al. (1987) found that most sculpins were female (22 of 27) with 12 having developing eggs. Spawning by sculpins takes place in late fall or winter (Scott and Scott, 1988). Eggs are laid in a small clump within a shallow depression and are guarded by the male during incubation. Given the very slow growth rate and maturation of gonads, it is possible that all of the apparently mature sculpins may not have spawned in winter of 2003/2004 and some individuals may have waited an additional year. Nevertheless, the gonads of most individuals did appear to be quite ripe and these individuals would certainly spawn within the next few months. Fallis et al. (1987) observed eggs in sculpin stomachs in 1976. Presuming these were from sculpins, it is possible that some individuals may spawn during late summer.

3.3.3.5. Tissue Metals

Whole body concentrations of manganese, lead and zinc in sculpins were higher in 2003 than was measured in sculpin tissue prior to mining (Fallis et al., 1987; BC Research, 1978) (Appendix C; Table 10). Other metals including arsenic, cadmium, copper, mercury, and nickel were lower or did not differ among years. Elevated lead and zinc concentrations in sediment and the water column as a result of the spill have resulted in increased tissue metals concentrations, however the magnitude of increase is relatively small. Prior to mining, mean zinc concentration was about 30 mg/kg and increased to only 72 mg/kg in 2003. The magnitude increase in lead concentration between pre-mining (0.58 mg/kg) and post mining (0.81 mg/kg) was also similar (Fallis et al., 1987). Fallis et al. (1987) stated that only copper and iron were significantly positively correlated with fish size while all other metals showed no relationship or a declining trend.

Relative to metals in sculpins elsewhere, Bohn and Fallis (1978) found that Garrow Lake sculpins were higher in lead and zinc but lower in cadmium and arsenic than Strathcona Sound sculpins. Elevated lead and zinc concentration prior to mining is presumably due to naturally higher mineralization. The tailings spill has caused a further increase in lead and zinc concentration.

3.3.4. Summary

The sculpin community of Garrow Lake is unique and has survived in this small, brackish water meromictic lake since glacial uplift isolated it from the marine environment nearly 3,000 years ago. The sculpin population has survived twenty years of mining tailings disposal to the monimolimnion and at least one significant tailings spill into the mixolimnion.

Overall, it appears as if the size, distribution, growth rate and reproductive status of the sculpin community has not changed markedly since pre-mining studies by Fallis et al. (1987) and BC Research (1978; 1980) although population size appears to have diminished. Only concentrations of lead and zinc in tissue have increased over the course of mining, likely as a result of the tailings spill in 1984/85. However, based on a survey of the zooplankton and benthic communities and diet of sculpins, it appears that the planktonic invertebrate community of Garrow Lake may have declined since tailings deposition began and that sculpins may be relying solely on benthos as a food source.

Introduction of tailings into the monimolimnion of the lake has caused the bottom layer to become less saline, more homogeneous and has caused a gradual displacement of the pycnocline and mixolimnion upwards in the water column. In 2004, once the lake has been drawn down to its original level, the depth of the mixolimnion above the pycnocline should diminish to about 7.5 or 8 m. Although the magnitude of the thermal and salinity

difference between the mixolimnion and the monimolimnion in the lake will be sufficient to maintain separation of the two layers and prevent turnover and mixing (AXYS, 2001) the largest change in the limnology of the lake is the reduced depth of the mixolimnion and surface area of the littoral zone.

Garrow Lake is very unproductive with low water column nutrient concentrations, a depauperate planktonic community and a benthic community dominated by oligochaetes, with very few insect larvae. A reduction in the planktonic community and diminishment in mixolimnion depth and littoral zone area will necessarily reduce habitat area and benthic invertebrate abundance. This loss of habitat and diminishment of food resources will ultimately, reduce population abundance. Sculpins seemed to be more difficult to capture in 2003 than in fishing efforts by Fallis et al. (1987) and BC Research (1978; 1980), which supports the hypothesis of a smaller population size in 2003 than pre-mining.

Nevertheless, sculpins have survived in Garrow Lake throughout the history of mining and tailings deposition to the lake, which is still designated as a tailings disposal facility (DFO, 2002). Provided that sufficient habitat and food resources exist within the spatially small littoral zone, the sculpin population will be sustained through the future.

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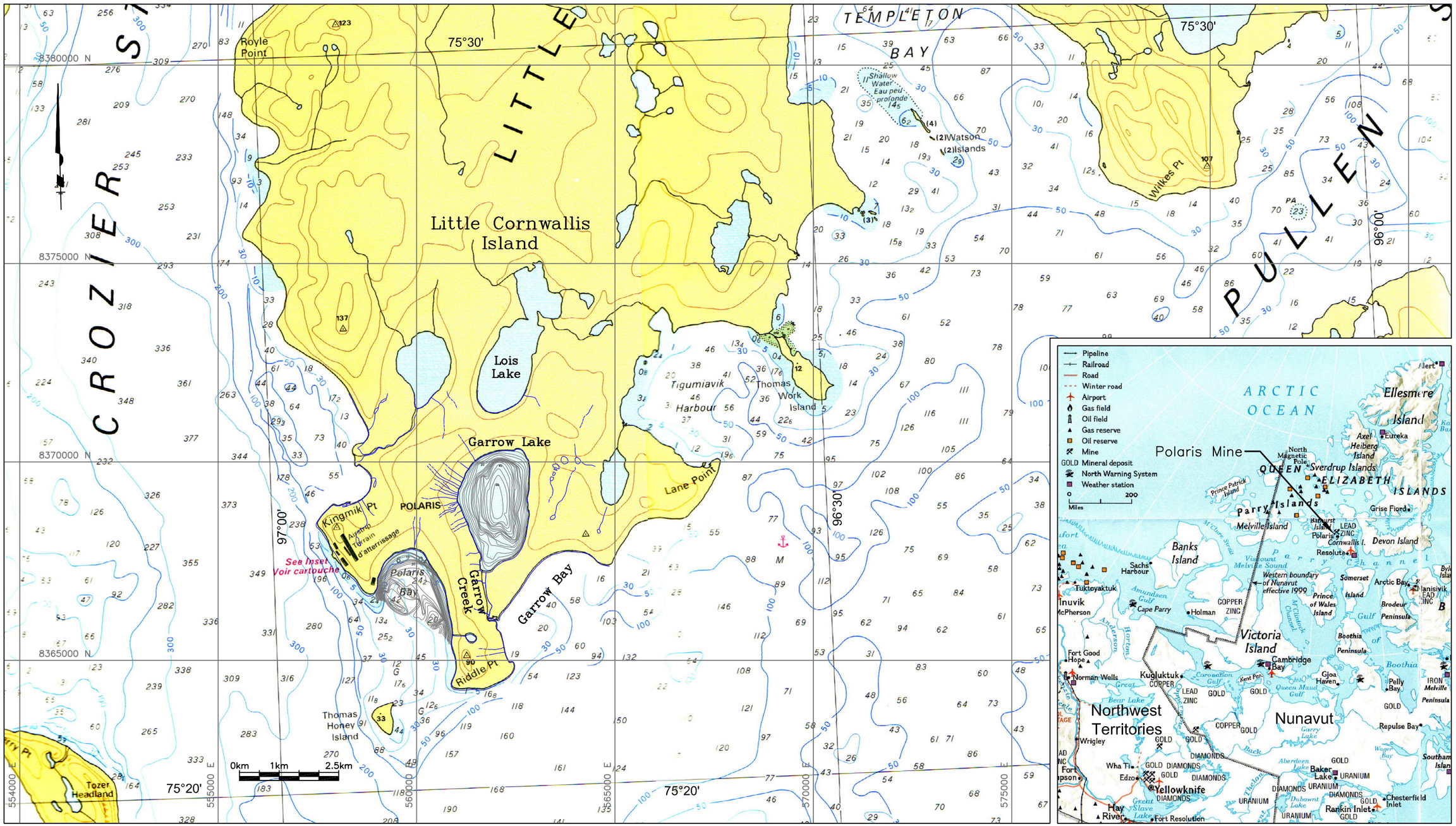
FIGURES



Carrow Lake, Polaris Bay contour data and surrounding creeks digitized from Map 1 Sampling Sites 1980 *prepared by B.C. Research January 1978*

Other data from Crozier Strait And/Et Pullen Strait 7935 *corrected 2003-03-28 published by the Canadian Hydrographic Service*

Insert Location Map from The Modern North: Roads, Radar Stations, and the End of Isolation, *Produced by National Geographic Maps for National Geographic Magazine, Sept. 1997*

AZIMUTH

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver BC, V6K 2G8

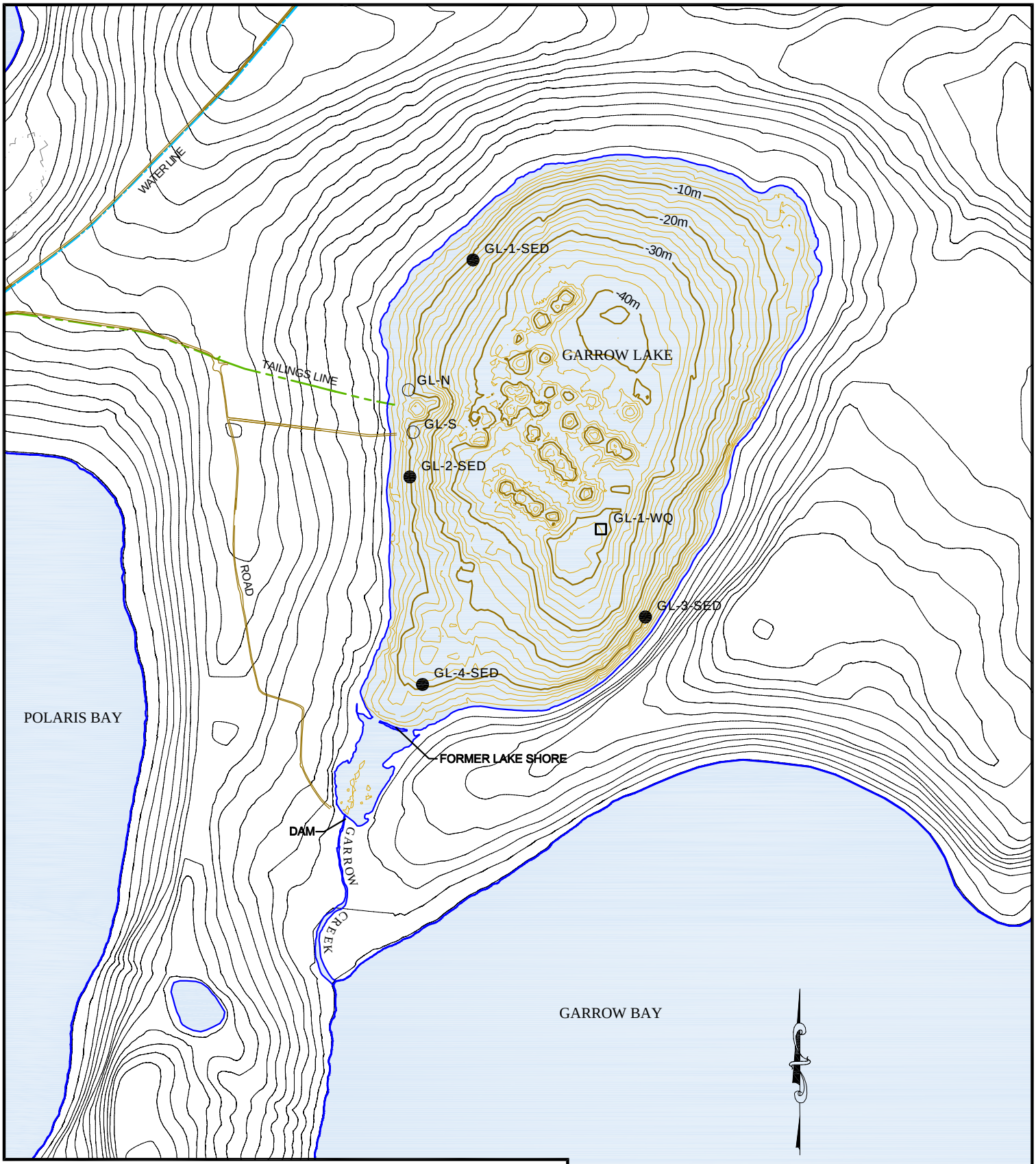
DRAWN BY:	CHK. BY:	PROJECT No:
BT	RB	TC-03-03
SCALE:	DATE: 6/10/2003 2:52 PM	

PROJECT: Polaris

TITLE: **Polaris Mine Study Area**

CLIENT: Teck Cominco

Figure 1-1



LEGEND

- BENTHOS, ZOOPLANKTON, SEDIMENT
- LAKE WATER (VERTICAL PROFILE)
- SEDIMENT

NOTE:

SURROUNDING CREEKS DIGITIZED FROM MAP 1 SAMPLING SITES 1980, PREPARED BY B.C. RESEARCH JANUARY 1978.

AZIMUTH
218 - 2902 WEST BROADWAY
VANCOUVER BC, V6K 2G8

CLIENT: TECK COMINCO

SHEET TITLE: LOCATION OF LITTORAL ZONE SEDIMENT / BIOTA STATIONS AND WATER QUALITY PROFILE STATION - GARROW LAKE, AUGUST 2003

PROJECT: POLARIS

REVISIONS

CHECKED BY: RB
SCALE: 1:25,000
Charone
www.charone.ca

JOB NO.: TC-03-03
DATE: 11-22-2004
DRAWN BY: CCL

FIGURE: 002

Figure 3a. Temperature (C) depth profile in Garrow Lake, 2003.

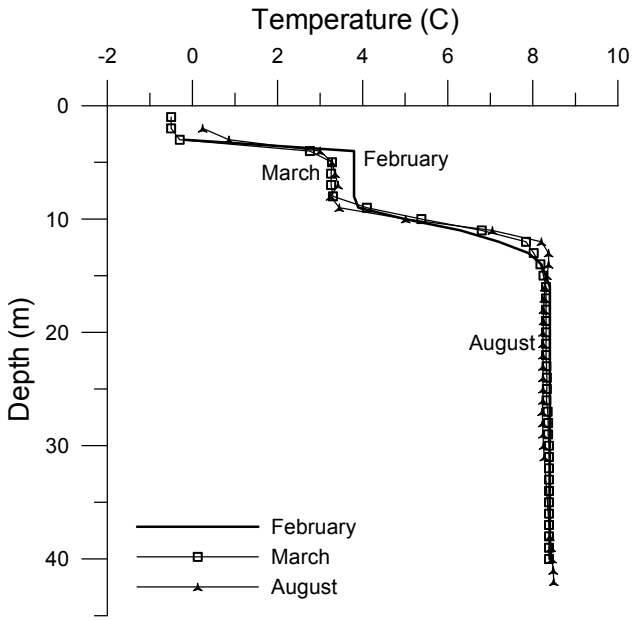


Figure 3b. Dissolved oxygen (mg/L) depth profile in Garrow Lake, 2003.

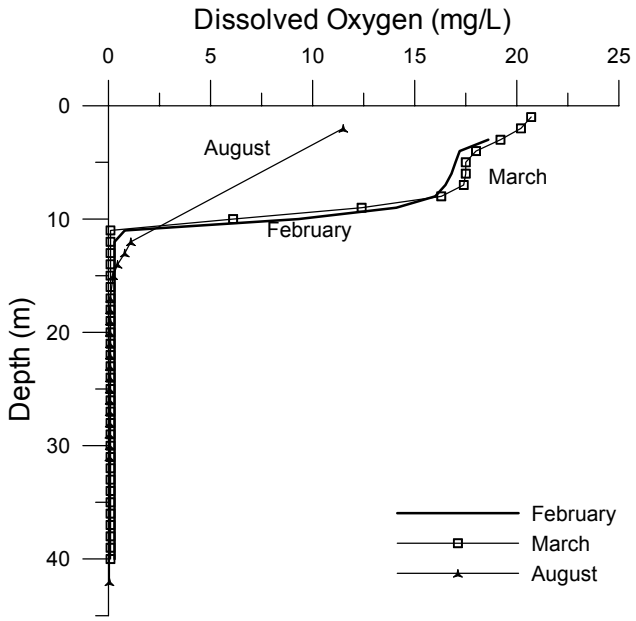


Figure 3a. Temperature (C) depth profile in Garrow Lake, 1976.

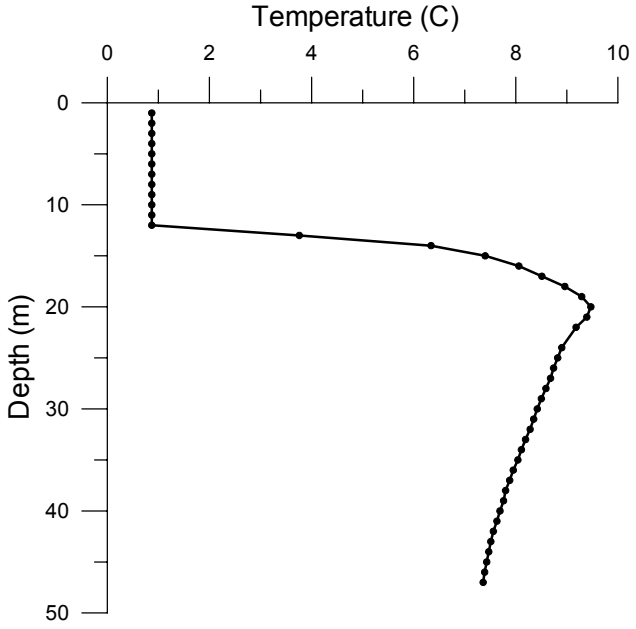


Figure 3b. Dissolved oxygen (mg/L) depth profile in Garrow Lake, 1976.

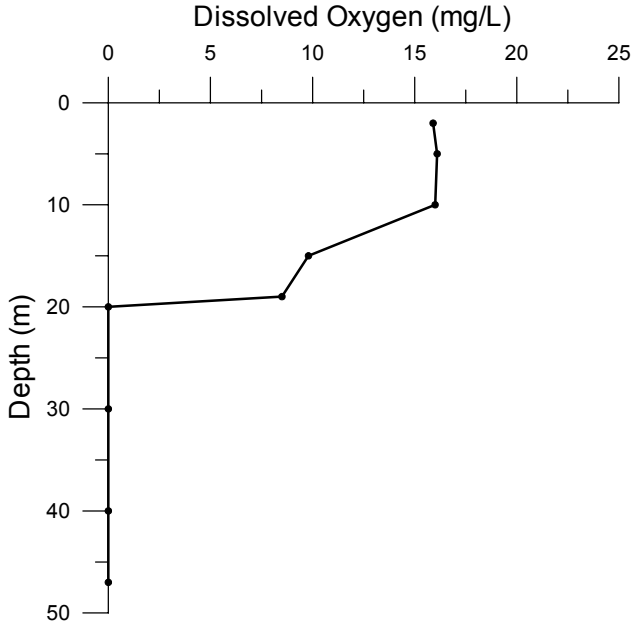


Figure 3c. Salinity (ppt) depth profile in Garrow Lake, 2003.

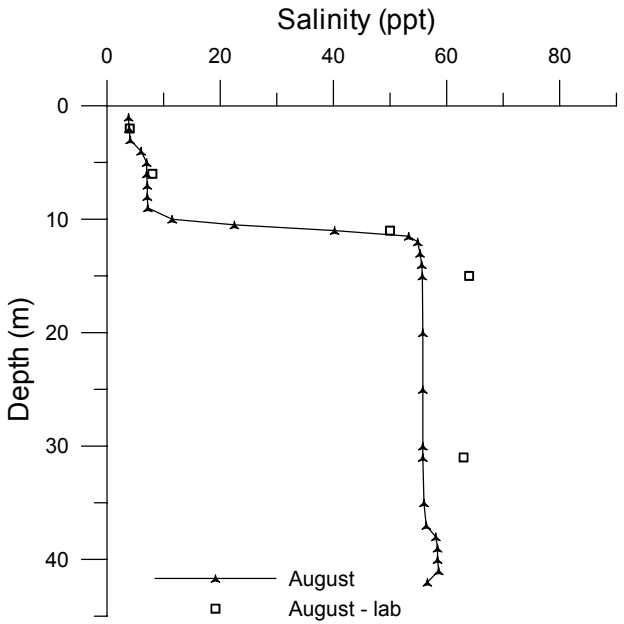


Figure 3c. Salinity (ppt) depth profile in Garrow Lake, 1976.

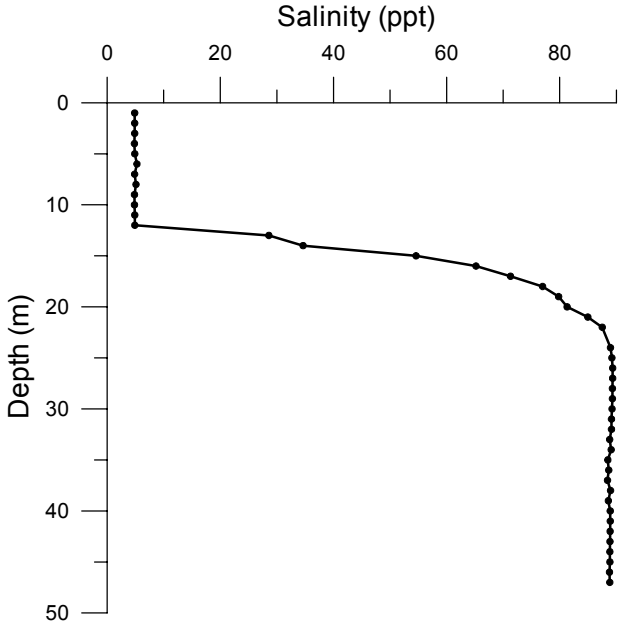
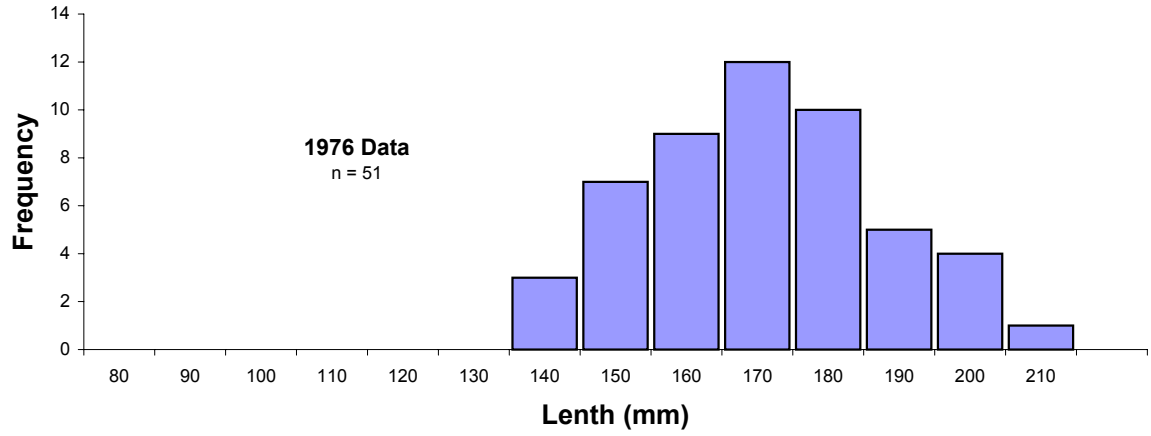
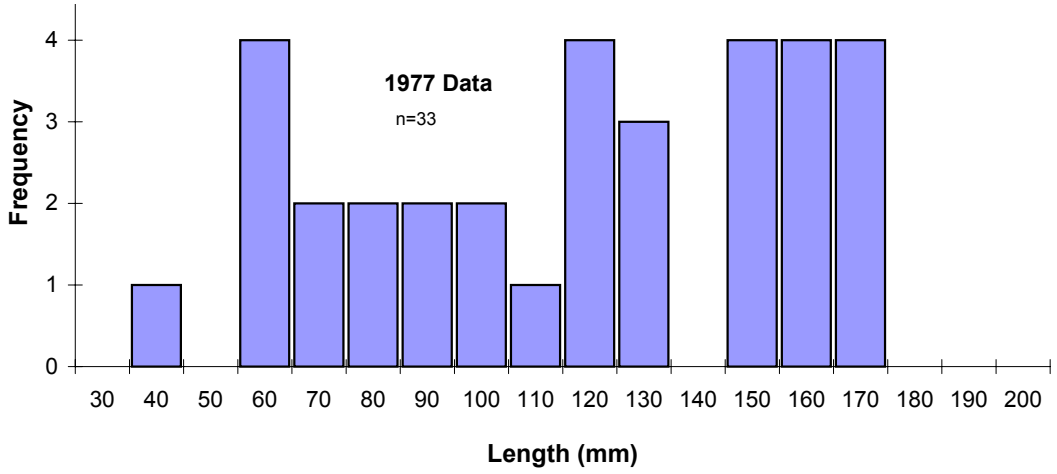
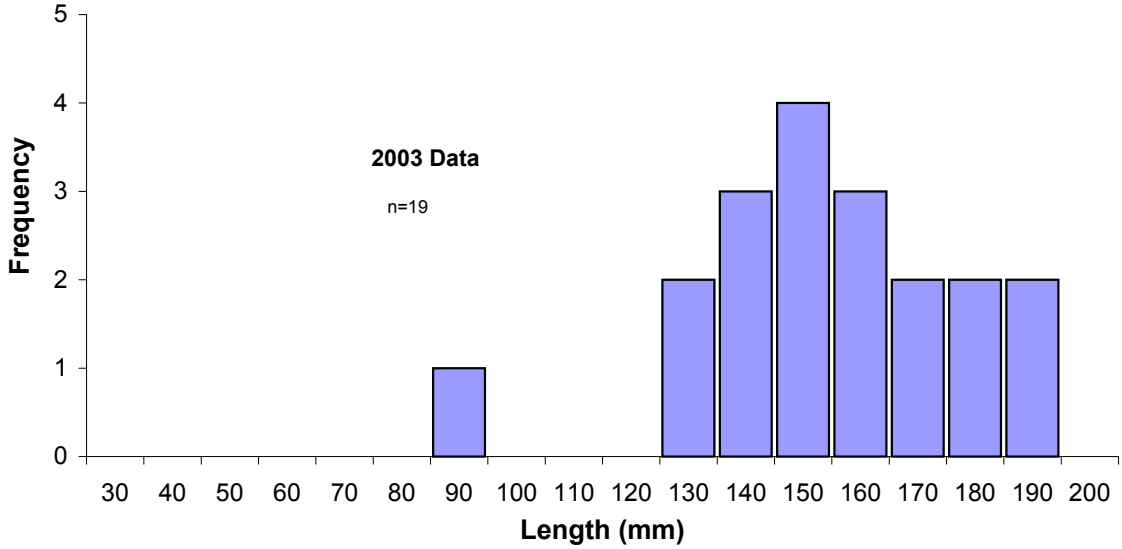


Figure 4. Comparison of length - frequency distribution of fourhorn sculpin from 1976 (Fallis et al., 1987) 1977 (BC Research (1978) and 2003.







TABLES

Table 1. Details of sediment, water and biota collections from Garrow Lake, August 8 – 10, 2003.

Station	UTM N	UTM E	Depth (m)	Parameter: Water	Parameter: Benthos	Parameter: Zooplankton	Parameter: Sediment	Observations
GL-1-SED	8369695	0561130	7.5		X	X	X	Thin light brown soft flocculent surface layer. Some algal growth on surface. Beneath, sediment is uniform grey clay, uniform consistency and appearance.
GL-2-SED	8368612	0561266	6.5 – 8.5		X	X	X	Similar in appearance to SED-1; rusty oxidized, brown surface layer over battleship grey layer of uniform consistency with fine organic matter.
GL-3-SED	8368424	0562669	6 – 8		X	X	X	Fine brown organic 2 – 3 mm layer over grey-brown clay. Grab 3 different from 1 and 2 with darker sediment and more organically rich layer.
GL-4-SED	8367556	0561764	7		X	X	X	Fine orangey-brown layer (2 – 3 mm) over grey-brown silty clay. Benthos not apparent.
GL-N-SED			8				X	Sediment appeared to be consistent with tailings; chalky white, fine grain flocculent sediment throughout grab with black sticky varves.
GL-S-SED			8				X	
GL-1-WQ	8369695	0561130	0 – 42	X				

Table 2. Summary of Garrow Lake water column metals concentration (mean, range; ug/L), 1976 - present.

			Arsenic		Cadmium		Copper		Lead		Nickel		Zinc	
		n	mean	range	mean	range	mean	range	mean	range	mean	range	mean	range
June 1976[AB]	Mixolimnion	19	0.3	0.1 - 1.1	0.3	0.1 - 1.3	1	0.2 - 2.7	0.3	0.1 - 0.5			3	1.3 - 6.7
(Fallis et al., 1987)	Pycnocline	4	1.9	0.3 - 3.5	0.2		2.8	1.5 - 4.1	0.4				2.9	1.9 - 3.8
	Monimolimnion	7	13.4	4.7 - 20.4	0.2	0.1 - 0.2	4	0.9 - 14.5	0.3	0.1 - 0.5			1	0.1 - 2.2
August 1977	Mixolimnion	12	<1		0.2	<0.1 - 0.6	10	1 - 60	5	<1 - 16			24	6 - 100
(BC Research 1978)	Pycnocline	17	<1		0.3	<0.1 - 0.6	12	2 - 22	3	<1 - 7			21	4 - 50
	Monimolimnion	13	4.6	<1 - 6.4	<0.5	<0.5	18	5 - 22	8	<5 - 27			18	8 - 28
May & August 1980	Mixolimnion	14	<1		>0.5		19	6 - 32	<1				49	20 - 95
(BC Research 1981)	Pycnocline	24	<1		>0.5		23	13 - 36	<5				46	28 - 85
	Monimolimnion	18	8	3.4 - 13	>0.5		16	3 - 50	<10				48	15 - 113
August 1981	Mixolimnion	2			>0.5		1.0		<10		7		10	9 - 12
(Ouellet & Dickman 87)	Pycnocline	1			1.0		>1		<10		10		9	
	Monimolimnion	7			<1.2		<2.4		<24		11		16	7 - 34
October 1981	Mixolimnion	2	0.06	0.06 - 0.06	0.06	0.06 - 0.06	0.35	0.3 - 0.4	0.35	0.3 - 0.4			3.3	2 - 4.6
(Fallis et al. 1987)	Pycnocline	3	0.29	0.17 - 0.34	0.3	0.2 - 0.4	5.5	1.5 - 8.9	1.0	0.8 - 1.2			5.7	4.2 - 6.8
	Monimolimnion	27	13.3	1.6 - 20	0.1	<0.05 - 0.2	1.3	<0.1 - 6.4	0.3	<0.1 - 1.8			4.1	1.2 - 6.3
September 1984	Mixolimnion	1							5				20	
(BC Research, 1988)	Pycnocline	1							5				40	
	Monimolimnion	1							14				30	
September 1987	Mixolimnion	1							7				230	
(BC Research, 1988)	Pycnocline	1							5				220	
	Monimolimnion	2							25				45	
May 1990	Mixolimnion	1							10				410	
(BC Research, 1988)	Pycnocline	1							21				1,820	
August 1998	Mixolimnion	4	<1		1.0	<1 - 1	1.0	<1 - 1	2	<1 - 5	<2		198	150 - 320
(Teck Cominco)														
August 1999	Mixolimnion	4	<1		1.0		2.3	<1 - 4	15.3	13 - 22	5	4 - 5	233	220 - 270
(Teck Cominco)														
August 2001	Mixolimnion	4	<1		<2		1.5	<1 - 2	1.8	<1 - 3	4	3 - 5	223	180 - 330
(Teck Cominco)														
August 2003	Mixolimnion	2	<1	<1 - 1	0.5	0.3 - 0.6	1	0.9 - 1.4	0.8		3	2.1 - 3.7	184	127 - 240
	Pycnocline	1	<1		2.5		7		4		9		1,140	
	Monimolimnion	2	1	<1 - 1	0.4	0.3 - 0.5	5	3.8 - 5.2	12	11.8 - 12.1	9	8.8 - 9.0	278	217 - 338

[A] Values below detection limit were treated as absolute values.

[B] Dissolved metals, otherwise, total metals

Table 3. Conventional parameters and total metal concentration (ug/L) in water samples collected from Garrow Lake, August 2003.

Sample ID	GL-1-WQ-2m	GL-1-WQ-6m	GL-1-WQ-11m	GL-1-WQ-15m	GL-1-WQ-31m
CONVENTIONAL PARAMETERS					
pH	8.2	8.0	7.2	7.3	7.4
Salinity o/oo	4.0	8.0	50.0	64.0	63.0
Temperature (C)	0.2	3.4	7.1	8.3	8.3
TOTAL METALS (µg/L)					
Aluminum	<100	<100	<100	<100	<100
Arsenic	<1	<1	<1	1.0	<1
Cadmium	0.3	0.6	2.5	0.3	0.5
Copper	0.9	1.4	7.1	5.2	3.8
Lead	0.8	0.8	4.3	11.8	12.1
Molybdenum	<2	3	2	4	<2
Nickel	2	4	9	9	9
Zinc	127	240	1140	338	217

Table 4. Total metals (mg/kg dw) in Garrow Lake sediment, prior to mining.

	Fallis et al. (1987) June 1976 (n=9)		BC Research (1978) August 1977 (n=2)		BC Research (1981) May and August 1980 (n~19)	
Total Metals	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**
Arsenic	6	2 - 11	5	4 - 6	4.7	3.2 - 57.6
Cadmium	1.00	<0.25 - 3.1	0.7	0.4 - 1.0	1.3	0.3 - 3.0
Copper	23	15 - 31	18.5	18 - 19	22	12 - 27
Lead	0.25	<0.25 - 0.75	8	8	8.4	5.9 - 11
Manganese	150	59 - 209				
Mercury	0.15	0.005 - 0.025			<0.05	<0.5 - 0.6
Nickel	19	12 - 39				
Zinc	61	30 - 103	65	59 - 70	84	52 - 96
Depth Range (m)		3 - 48		12 and 19		5 - 48

Table 5. Conventional sediment parameters and total metals concentration (mg/kg) in Garrow Lake littoral zone sediment.

	Garrow Lake Stations (Aug 2003)					Tailings Spill Area		1976 (Pre-Mine)
Sample ID	**GL-1**	**GL-2**	**GL-3**	**GL-4**		**GL-N North**	**GL-S South**	**Fallis et al. 1987**
Depth (m)	**7.5**	**6.5 - 8.5**	**6 - 8**	**2 - 7**	**Mean**	**7 - 8**	**7 - 8**	**3 - 48**
CONVENTIONAL PARAMETERS								
Organic Parameters								
Total Organic Carbon (% dw)	<0.8	1.2	<0.9	2.4	1.3	-	-	-
Particle Size (%)								
Gravel (>2.00mm)	<0.1	<0.1	0.9	<0.1	0.3	-	-	-
Sand (2.00mm - 0.063mm)	5.4	7.5	12.3	6.8	8.0	-	-	-
Silt (0.063mm - 4um)	64.2	68.3	70.3	76.1	69.7	-	-	-
Clay (<4um)	30.4	24.2	16.5	17.1	22.1	-	-	-
Total Metals								
Aluminum	8560	7380	6030	6680	7162	781	547	
Antimony	<10	<10	<10	<10	<10	<20	<20	
Arsenic	11	9	<5	9	8.5	<10	<10	6
Barium	1420	1070	1040	1150	1170	122	124	
Beryllium	0.6	<0.5	<0.5	<0.5	0.5	<1	<1	
Cadmium	1.9	3	1.1	1.4	1.9	17	15	1.0
Chromium	19	18	15	16	17	22	9	
Cobalt	6	6	4	5	5.3	<4	<4	
Copper	31	32	17	24	26	68	24	23
Lead	114	308	47	78	137	1000	680	0.25
Manganese	183	222	175	172	188	487	493	150
Mercury	0.1	0.09	0.05	0.17	0.1	0.08	0.06	0.15
Molybdenum	4	<4	<4	<4	4	<8	<8	
Nickel	36	30	19	26	28	<10	<10	19
Strontium	268	209	217	289	246	64	52	
Zinc	700	1210	498	560	742	7360	5980	61

Table 6. Abundance and density of benthic invertebrates in Garrow Lake and Garrow Creek, Little Cornwallis Island, August, 2003.

Location		Creek-mid	Creek-up	GL-1	GL-2	GL-3	GL-4
Date		4-Aug-03	4-Aug-03	7-Aug-03	7-Aug-03	8-Aug-03	8-Aug-03
Species/Group	Stage**						
FORAMINIFERA							
Unidentified							350
NEMATODA							
Unidentified		5		1		20	
OLIGOCHAETA							
Unidentified	juv*	5		17	65	200	100
Enchytraidae		471	10	418	390	1470	550
COPEPODA							
Cyclopoida	juv*						1
EPHEMEROPTERA							
Baetidae							
Baetis bicaudatus	N	2					
DIPTERA							
Chironomidae	P	1					
Tanypodinae							
Procladius	L	1					
Orthocladiinae							
Eukiefferiella	L	1					
Orthocladius	L	1					
Diamesinae							
Diamesa	L	4	1				
Total		491	11	436	455	1690	1001
Oligochaete Abundance				435	455	1670	650
Oligochaete Density (#/m^2)				18125	18958	69583	27083

**Key:

L = Larva

N = Nymph

P - Pupa

juv = Juvenile

* = Too small to be idetified further, damaged

Table 7. Biological data for fourhorn sculpin from Garrow Lake, August 2003.

Code	Total Length (mm)	Body Weight (g)	Lipid (%)	Age (yrs)	K[1]	Gender	Maturity	Stomach Content	Condition	
									Liver	External
SC-1-03	149	24.8	14.3	6	0.75	F	Ripe	1 chironomid and plant material	large, healthy	good
SC-2-03	129	16.0	8.8	5	0.75	F	Ripe	3 chironomids, small stomach	healthy, pink	good
SC-3-03	138	20.5	12.8	6	0.78	M	Ripe	Empty	large, healthy	good
SC-4-03	163	34.5	15.7	4	0.80	F	Ripe	Empty	healthy	healthy
SC-5-03	184	37.9	7.2	9	0.61	M	Ripe	Unidentified material in stomach	healthy	healthy
SC-6-03	160	25.7	8.9	6	0.63	M	Ripe	Empty	healthy	healthy
SC-7-03	121	12.2	10.6	4	0.69	M	Ripe	Empty	healthy	healthy
SC-8-03	182	40.3	7.8	6	0.67	F	Ripe,well-developed, large	Empty	healthy	healthy
SC-9-03	146	21.4	10.6	7	0.69	M	Ripe	Empty	healthy	healthy
SC-10-03	142	20.0	8.7	7	0.70	F	Ripe	Empty, algae lower in intestine	healthy	healthy
SC-11-03	85	4.2	9.9	3	0.68	F	Ripe, large GSI, may spawn.	Empty	healthy	healthy
SC-12-03	176	34.8	-	-	0.64	-	-	-	-	-
SC-13-03	157	31.3	-	-	0.81	-	-	-	-	-
SC-14-03	159	31.2	-	-	0.78	-	-	-	-	-
SC-15-03	141	21.2	-	-	0.76	-	-	-	-	-
SC-16-03	139	17.7	-	-	0.66	-	-	-	-	-
SC-17-03	174	41.2	-	-	0.78	-	-	-	-	-
SC-18-03	132	14.9	-	-	0.65	-	-	-	-	-
SC-19-03	161	24.0	-	-	0.58	-	-	-	-	-
Mean	149	24.9	10.5	5.7	0.70	-	-	-	-	-
SD	23.8	10.1	2.7	1.7	0.07	-	-	-	-	-

[1]K = Condition Factor = (body weight x 10^5) / total length^3

Note: SC-1-03 to SC-11-03 used for tissue chemistry analyses, the other 8 were measured live and released.

Table 8. Mean (range) total length (mm), weight (g) and condition (K) of Garrow Lake sculpin from pre-mine (1976, Fallis et al. 1987; 1977, BC Research 1978) and 2003.

Year	n	Total Length (mm)			Body Weight (g)			Condition Factor (K)		
		Mean	Range	SD	Mean	Range	SD	Mean	Range	SD
1976	51	155	120 - 194	2	26.6	10 - 45		- (0.72^)	-	-
1977	33	112	38 - 168	40	10.8	0.9 - 26.6	8.2	0.56[#] (0.77^)	(0.43 - 0.70)[#]	0.07[#]
2003	19	149	85 - 184	24	24.9	4.2 - 41.2	10.1	0.70 (0.75^)	(0.58 - 0.81)	0.07

[1]K = Condition Factor = (body weight x 10^5) / total length^3

^ calculated from mean length and weight

[#] using fish with minimum length of 90mm

Table 9. Length - weight relationship for Garrow Lake sculpin, 1976, 1977 and 2003.

Year	n	Regression	R^2
1976[A]	51	$Log_{10}(weight) = 2.82 * Log_{10}(length) - 4.78$	0.99[A]
1977	33	$Log_{10}(weight) = 2.40 * Log_{10}(length) - 3.98$	0.97
2003	19	$Log_{10}(weight) = 2.96 * Log_{10}(length) - 5.06$	0.97

[A] Regression equation for 1976 data derived using curvilinear plot.
1976 (Fallis et al. 1987); 1977 (BC Research, 1978)

Table 10. Mean (range) of fourhorn sculpin whole body metal concentration (mg/kg ww) from Garrow Lake during pre-mine (1976, Fallis et al. 1987; 1977, BC Research 1978; 1980, BC Research 1981) and 2003 (post-mine).

	Pre - Mine						Post-Mine	
	1976 (n=10)		1977 (n=34)		1980 (n = 35)		2003 (n=11)	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Body Length (mm)			112	38 - 168	132	78 - 164	145	85 - 184
Body Weight (g)			11	1 - 27	10	2 - 19.2	23	4 - 40
Total Metals (mg/kg ww)								
Aluminum							16	3 - 40
Antimony							<0.01	
Arsenic	0.74	0.47 - 1.18	1.15	0.53 - 2.58	0.55	0.22 - 1.1	0.88	0.53 - 1.48
Barium							3.33	1.59 - 5.36
Beryllium							<0.1	
Cadmium	0.07	0.04 - 0.12	0.11	0.01 - 0.24	0.1	0.02 - 0.33	0.057	0.026 - 0.103
Chromium							<0.1	
Cobalt							0.12	0.07 - 0.19
Copper	1.17	0.53 - 1.67	2.16	1.09 - 12.69	2.4	1.0 - 10.7	0.95	0.46 - 1.55
Lead	0.58	0.25 - 0.96	0.38	0.09 - 0.84	0.24	0.10 - 0.67	0.81	0.43 - 1.71
Manganese	0.77	0.56 - 1.03					3.15	1.24 - 6.46
Mercury	0.01	<0.01 - 0.02					0.006	<0.005 - 0.012
Molybdenum							<0.01	<0.01 - 0.01
Nickel	0.35	0.06 - 1.06					0.1	<0.1 - 0.2
Strontium							32	21 - 46.1
Zinc	28.9	15.6 - 41.8	34.4	16.0 - 66.7	34.5	16.3 - 55	72.3	50.4 - 120

PHOTOS

Photo 1 Garrow Lake showing ice cover August 4, 2003.

Photo 2 Launching the boat in Garrow Lake, August 8, 2003.

Photo 3 Garrow Lake showing gravel shoreline and mostly ice-free, August 8, 2003.

Photo 4 Garrow Lake Fourhorn sculpin *Myoxocephalus quadricornis*.

Photo 5 Garrow Lake fourhorn sculpin (140 mm total length) prior to dissection.

APPENDICES

Appendix A Department of Fisheries and Oceans Habitat Authorization

Fisheries and Oceans | Pêches et Océans

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

AUTHORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

DFO File No. 02-HCAA-000-000063
Authorization No./N° de l'autorisation

Authorization Issued To/Autorisation délivrée à

Name: Bruce Donald

Address: Teck Cominco Ltd.
Polaris Operations
Box 188
Resolute Bay, Nunavut
Canada X0A 0E0

Telephone: (867) 253-2201

Facsimile: (867) 253- 6862

Location of Project/Emplacement du projet

Polaris Mine is located on Little Cornwallis Island (centred at 391500 E, 8 369 000 degrees N UTM zone 15) in the Qikiqtalluk Region of Nunavut (approximately 100 km northwest of Resolute Bay). The project site encompasses fish habitat at Garrow Lake, Garrow Creek, and Crozier Strait.

Valid Authorization Period/Période de validité

From/De: June 2, 2003 **To/À:** October 30th , 2004

Description of HADD Works or Undertakings/Description des ouvrages ou entreprises

In order to decommission Teck Cominco's (TCL) Polaris Mine, draining of water from the surface layer of Garrow Lake (the mine's tailings facility) and partial removal of Garrow Lake Dam will be required. This will result in the harmful alteration, disruption and/or destruction of fish habitat (HADD) due to lowering of the level of the lake and excavation of benthic fish habitat adjacent to the dam. Partial removal of a sheet-pile dock on Crozier Strait, and excavation to contour the adjacent marine foreshore area will also temporarily alter fish habitat during construction. The above works will hereafter be referred to as the "Project Activities".

Summary of Habitat Loss

- Lowering the lake level of Garrow Lake and removal of the Garrow Lake Dam will dewater approximately 30 ha. of fish habitat. Garrow Lake has been documented to be habitat for fourhorn

sculpin *(Myoxocephalus quadricornus)* and has the potential to provide habitat for other fish species. Garrow Lake drains into Garrow Bay via Garrow Creek and provides supporting habitat for other fish species in Crozier Strait.

- Partial removal of the dock and excavation of the marine foreshore area at Polaris will alter 2512 m^2 of fish habitat. The marine foreshore area at Polaris is habitat for arctic charr, arctic cod, and marine mammals (e.g., narwhal, ringed seals, walrus).

Conditions of Authorization/Conditions de l'autorisation

1.0 All works and undertakings shall be undertaken in accordance with the documents approved by DFO entitled:

1.1 Application for Authorization for Works or Undertakings Affecting Fish Habitat submitted to DFO, dated October 5th, 2001 and signed by Bruce Donald, TCL.

1.2 The approved documents include the works or undertakings, proposed mitigative measures and compensation requirements (the *Project Plan*).

2.0 To compensate for the harmful alteration, disruption or destruction of fish habitat as a result of the Project Activities, the following shall be implemented, maintained and monitored by TCL, as indicated in the *Project Plan* or otherwise specified by DFO:

2.1 To rehabilitate and enhance fish habitat in Garrow Lake, upon completion of water withdrawal and dam removal, TCL shall conduct the following as indicated in the *Project Plan*:

Restore a natural stream channel to Garrow Bay by removing at least 19,000 cubic metres of dam fill material. The constructed 500 m long by 15 metre wide stream channel through the decommissioned dam will emulate natural stream conditions with a gravel/cobble streambed. Enhancement efforts will result in the banks of the remaining dam having a slope of at least 4:1.
The enhanced stream channel draining Garrow Lake will be on average 11 m wide and restore natural drainage patterns in the Garrow Lake area. Clean rock rip-rap will be placed to prevent erosion in the vicinity of the decommissioned dam;

2.1.3 A Fish Habitat Monitoring Report shall be submitted to DFO, including detailed photographs of Garrow Lake, stream channel development, prior to completion of the work. The intent of this Monitoring Report shall be to assess the success of fish habitat compensation upon implementation.

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2.2 To rehabilitate and enhance fish habitat in the area of the dock and marine foreshore area, TCL shall conduct the following as indicated in the *Project Plan*:

2.2.1 Partial removal of the dock pilings to a depth of 3m below the low tide water level will develop natural inter-tidal conditions with slope and substrate adequate to control erosion into Crozier Strait.

2.2.2 Excavation of the inter-tidal shoreline adjacent to the dock to develop 12,800 m^2 of marine nearshore habitat with a slope of less than 17.5:1 to prevent erosion.

2.2.3 A Fish Habitat Monitoring Report shall be submitted to DFO, including detailed photographs of the marine foreshore area adjacent to the dock. Underwater photographs or video footage of the dock will be provided to DFO. The intent of this Monitoring Report shall be to assess the success of fish habitat compensation upon implementation.

3.1 The following mitigation measures are intended to minimize or prevent further harmful alteration, disruption or destruction of fish habitat adjacent to Garrow Lake and Garrow Creek:

3.1.1 Excavation of the dam will be conducted prior to spring break-up in 2004 and all silt and loose fines shall be removed from the construction area prior to spring break-up.

3.1.2 Rock rip-rap will be placed on the banks of the stream channel adjacent to the dam to prevent erosion and sedimentation.

3.1.3 Appropriate mitigation measures will be implemented to control TSS, including the construction of a dam at the discharge of Garrow Lake, if water quality deteriorates due to release of sediment. Other contingencies may be required as mitigation measures to protect fish habitat such as silt fences.

3.2 Appropriate mitigation measures will be implemented in the marine foreshore area, at and adjacent to the dock, as follows:

3.2.1 To minimize erosion in the marine foreshore area mitigation measures will be implemented to prevent deposition of sediment into the marine waters by use of silt fences and a floating silt curtain along the perimeter of the marine foreshore area if this is deemed necessary.
Water quality sampling for turbidity will be conducted daily during work and mitigation measures will be implemented to address potential sediment release.

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4.0 Monitoring will be conducted to ensure that compensation measures are successfully implemented and identify potential long-term project effects:

4.1 Sampling of TSS and turbidity will be undertaken by TCL in different strata of Garrow Lake to monitor stability of the halocline and to confirm the absence of contaminants in the upper strata of the lake.

4.2 A study of the metal concentrations in sediments adjacent to the shore of Garrow Lake, Garrow Creek, and the centre of Garrow Bay will be commissioned by TCL. TCL will provide a study design prior to July 2003 for approval by DFO.

4.3 TCL will conduct a study on fish in Garrow Lake and Garrow Bay to examine metal levels in fish muscle tissue. A study design will be proposed by TCL to collect fish tissue samples for analysis by DFO. TCL will propose a sampling protocol for this study prior to July 2003.

4.4 Erosion will be monitored on the shore of Garrow Lake and Garrow Creek Stream channel. The study objective will be to quantify erosion rates adjacent to the lake and stream channel. This study will be proposed by TCL for DFO approval prior to July 2003.

4.5 TCL will conduct water quality sampling for TSS and turbidity at the Garrow Lake outflow in Garrow Creek. TCL will provide a Water Quality Sampling Report of TSS levels to the DFO Eastern Arctic Office on an annual basis for the duration of this authorization. Water quality sampling for TSS will not cease at the Garrow Lake outflow prior to 2004.

4.6 TCL will conduct water quality sampling for TSS and turbidity along the marine foreshore area prior to, during, and immediately following work in the inter-tidal zone. At least seven water quality samples will be routinely collected on a daily basis in the marine foreshore area during work in the inter-tidal zone. Two water quality samples per day will be collected adjacent to the dock.

5.0 A DFO Fishery Officer shall be notified at the Iqaluit Office ((867) 979-8000) of the proposed start time prior to commencement of the work.

6.0 Any deviation from the *Project Plan*, the construction schedule or the mitigation and compensation measures stated above that may potentially affect fish or fish habitat, must be discussed and approved in writing by DFO prior to implementation.

7.0 A copy of this Authorization shall be at the Polaris work site during all work periods. Work crews shall be made familiar with the conditions of this Authorization prior to implementation of the works or undertakings.

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DFO File No. 02-HCAA-000-000063
Authorization No./N° de l'autorisation

The holder of this Authorization is hereby authorized under the authority of subsection 35(2) of the *Fisheries Act*, R.S.C., 1985, c. F. 14, to carry out the work or undertaking described herein. This Authorization is valid only with respect to fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

Failure to comply with any condition of this Authorization may result in charges being laid under the *Fisheries Act*.

This Authorization form should be held on site and work crews should be made familiar with the terms and conditions of this authorization.

Le détenteur de la présente est autorisé en vertu du paragraphe 35(2) de la *Loi sur les pêches*, L.R.C. 1985, ch. F. 14, à exploiter les ouvrages ou entreprises décrits aux présentes.
L'autorisation n'est valide qu'en ce qui concerne l'habitat du poisson et pour aucune autre fin. Elle ne dispense pas le requérant de l'obligation d'obtenir la permission d'autres organismes réglementaires concernés ou de se conformer à leurs exigences.

En vertu de la *Loi sur les pêches*, des accusations pourront être porteés contre ceux qui ne respectent pas les conditions prévues dans la présente autorisation.

Cette autorisation doit être conservée sur les lieux des travaux, et les équipes de travail devraient en connaître les conditions.

Date of Issuance: Following NIRB Environmental Assessment

Signed by:

Burt Hunt
Area Director
Eastern Arctic Area
Fisheries and Oceans Canada
Central and Arctic Region

Prepared by:

Jordan DeGroot
Area Habitat Biologist
Fish Habitat Management
Eastern Arctic Area
Fisheries and Oceans Canada

Bruce Donald- Reclamation Manager, Environment and Corporate Affairs

Canada

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

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DFO File No. 02-HCAA-000-000063
Authorization No./N° de l'autorisation

Witness:

Teck Cominco Ltd.

Signature: Brian McKenzie

Teck Cominco Ltd.

Signature:

Copy signed by TCL received by DFO

Signature: Stephanie Critch

Date: July 23, 2003

Appendix B Garrow Lake Water Chemistry Data

Appendix B. Vertical profile of water chemistry parameters pre-mining (Fallis et al. 1987) and in 2003, after mining.

	Pre-Mine Profile			Post-Mine Profile							
	June 1976 (Fallis et al. 1987)			Winter 2003 (Teck Cominco)			August 2003				
Depth (m)	Temperature (oC)	Salinity ppt	D.O. mg/L	Temperature (oC)	Conductivity (mS)	D.O. mg/L	Temperature (oC)	Conductivity (mS)	pH	Salinity ppt	D.O. mg/L
1	0.85	4.9		-0.5	14.5	20.7	0	6.74	8.18	3.8	11.5
2	0.85	4.9	15.9	-0.5	14.8	20.2	0.24	6.93	8.18	3.9	11.5
3	0.85	4.9		-0.3	13.8	18.9	0.86	7.38	8.14	4.1	11.5
4	0.85	4.8	16.1	3.3	14.6	17.6	3	11.45	7.98	6	11.5
5	0.85	4.9		3.5	14.5	17.2	3.28	12.18	8	7	11.5
6	0.85	5.3		3.5	14.5	17.1	3.35	12.28	8	7	11.5
7	0.85	4.9		3.5	14.6	16.9	3.42	12.37	8.07	7.1	11.5
8	0.85	5.1		3.6	14.6	16.1	3.25	12.43	8.08	7.1	11.5
9	0.85	4.8		4.0	15.3	13.2	3.45	12.51	8.07	7.2	11.5
10	0.85	4.8	16	5.2	27.1	7.7	5.01	18	7.83	11.5	11.5
10.5							6.0		7.26	22.5	6.7
11	0.85	4.9		6.6	77.4	0.4	7.05	65.6	7.16	40.2	4.3
12	0.85	4.9		7.5	94.0	0.2	8.2	78.9	7.2	54.9	1.1
13	3.76	28.6		8.0	94.2	0.2	8.37	79.8	7.24	55.3	0.8
14	6.34	34.6		8.2	94.4	0.2	8.37	80.1	7.26	55.6	0.45
15	7.4	54.6	9.8	8.3	94.4	0.2	8.33	80.3	7.27	55.7	0.23
16	8.06	65.2		8.4	94.5	0.2	8.28	80.4	7.3	55.7	0.0
17	8.51	71.3		8.4	94.5	0.2	8.27	80.4	7.3	55.7	0.0
18	8.96	77.0		8.4	94.5	0.2	8.25	80.5	7.31	55.7	0.0
19	9.29	79.8	8.5	8.4	94.5	0.2	8.25	80.5	7.31	55.7	0.0
20	9.47	81.3	0.0	8.4	94.5	0.2	8.24	80.5	7.32	55.8	0.0
21	9.39	85.0		8.4	94.5	0.2	8.24	80.4	7.33	55.8	0.0
22	9.18	87.5		8.4	94.5	0.2	8.24	80.5	7.33	55.8	0.0
23	9.0	88.8		8.4	94.5	0.2	8.24	80.5	7.33	55.8	0.0
24	8.9	89.0		8.4	94.5	0.2	8.24	80.5	7.34	55.8	0.0
25	8.82	89.2		8.4	94.6	0.2	8.24	80.5	7.34	55.8	0.0
26	8.74	89.4		8.4	94.6	0.2	8.24	80.5	7.34	55.8	0.0
27	8.68	89.3		8.4	94.6	0.2	8.22	80.5	7.35	55.8	0.0
28	8.59	89.3		8.4	94.6	0.2	8.23	80.5	7.35	55.8	0.0
29	8.5	89.3		8.4	94.5	0.2	8.24	80.5	7.35	55.8	0.0
30	8.42	89.2	0.0	8.4	94.7	0.2	8.25	80.5	7.35	55.8	0.0
31	8.35	89.1		8.4	94.6	0.2	8.25	80.5	7.35	55.8	0.0
32	8.28	89.1		8.4	94.6	0.2	8.25	80.5	7.35	55.8	0.0
33	8.19	88.8		8.4	94.7	0.2	8.25	80.5	7.35	55.8	0.0
34	8.11	89.1		8.4	94.7	0.2	8.25	80.5	7.35	55.8	0.0
35	8.04	88.5		8.4	94.6	0.2	8.27	80.5	7.35	55.8	0.0
36	7.95	88.7		8.4	94.6	0.2	8.27	80.5	7.35	56	0.0
37	7.88	88.4		8.4	94.7	0.2	8.27	80.5	7.35	56.4	0.0
38	7.8	89.0		8.4	94.7	0.2	8.4	83.4	7.35	58.1	0.0
39	7.76	88.6		8.4	94.7	0.2	8.43	83.9	7.35	58.4	0.0

Appendix C Fish Metals Concentrations, Garrow Lake 2003.

Appendix C. Total metal concentration (mg/kg ww) for individual fourhorn sculpin, Garrow Lake, August 2003.

Sample ID Total Metals (mg/kg ww)	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10	SC-11	Mean	SD	Range
Aluminum	20	13	21	19	5	9	23	3	21	40	7	16	10.61	3 - 40
Antimony	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	
Arsenic	0.59	0.93	0.59	1.10	1.42	1.48	0.66	0.82	0.77	0.81	0.53	0.88	0.33	0.53 - 1.48
Barium	3.63	2.93	3.70	3.00	2.55	2.32	2.83	1.59	5.36	5.15	3.61	3.33	1.14	1.59 - 5.36
Beryllium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0	
Cadmium	0.087	0.051	0.044	0.038	0.062	0.042	0.103	0.026	0.051	0.075	0.043	0.057	0.023	0.026 - 0.103
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0	
Cobalt	0.14	0.15	0.09	0.09	0.09	0.10	0.13	0.07	0.14	0.19	0.10	0.12	0.04	0.07 - 0.19
Copper	0.74	0.65	0.59	1.06	0.75	0.94	0.74	0.46	1.55	1.43	1.52	0.95	0.39	0.46 - 1.55
Lead	0.80	0.57	0.83	0.73	0.87	0.92	0.78	0.43	0.63	1.71	0.62	0.81	0.33	0.43 - 1.71
Manganese	3.37	6.46	2.29	3.15	1.24	2.78	3.34	1.60	3.36	4.31	2.77	3.15	1.40	1.24 - 6.46
Mercury	<0.005	<0.005	<0.005	0.005	0.012	0.006	<0.005	<0.005	<0.005	0.005	0.006	0.006	0.002	<0.005 - 0.012
Molybdenum	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.00	<0.01 - 0.01
Nickel	0.1	0.1	0.1	0.1	0.1	0.1	0.2	<0.1	0.2	0.2	0.2	0.1	0.1	<0.1 - 0.2
Strontium	21	30.4	27.9	36	46.1	41.5	25.1	35.7	30.8	29.8	25.6	31.8	7.4	21 - 46.1
Zinc	53.1	71.5	60.9	78.6	120	86.5	54.3	50.4	85.1	78	57.3	72.3	20.6	50.4 - 120

APPENDIX 22

REPORT in ELECTRONIC FORMAT (.pdf)

ON CD