Roberts Bay and Ida Bay Abandoned Mine Sites Waste Audit Final Report

Prepared for:

Public Works & Government Services Canada
Environmental Services, Western Region
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Celebrating 100 years in Canada

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Public Works and Government Services Canada
Environmental Services
5th Floor, 10025 Jasper Avenue
Edmonton, AB
T5J 1S6

Attention: Mr. Jared Buchko

Dear Sir:

Re: Roberts and Ida Bay Abandoned Mine Sites – Waste Audit
Final Report

Earth Tech Canada Inc. is pleased to submit five copies of our report presenting the results of the waste audit that was completed at the Roberts Bay and Ida Bay abandoned silver mines in Nunavut.

Thank you for the opportunity to be involved in this interesting project. If you have any questions, please contact the undersigned at 453-0710.

Very truly yours,

EARTH TECH (CANADA) INC.
Per:

Gordon Woollett, P.Eng.
Project Manager Environment Group

Encl.

ROBERTS BAY AND IDA BAY ABANDONED MINE SITES
WASTE AUDIT

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1.0 EXECUTIVE SUMMARY

In order to assist in the development of a remedial plan for the Roberts and Ida Bay Mine sites, Public Works Government Services Canada (PWGSC) was required to complete further assessments at the site. The assessments include the completion of a subsurface environmental (Phase III) assessment, a waste audit of hazardous and non-hazardous materials, the completion of a geotechnical investigation to identify potential borrow and landfill sites as well as the completion of a geophysical assessment to identify areas with buried debris.

In August 2005, on behalf of the Department of Indian Affairs and Northern Development (DIAND), PWGSC commissioned Earth Tech to complete the above assessments at the Roberts and Ida Bay Mine sites. In addition, PWGSC also commissioned AMEC to complete a geochemical assessment and an assessment of all mine related workings. The fieldwork for this program was completed between August 15 and August 22, 2005.

A detailed Waste Audit was completed at both the Roberts and Ida Bay sites in order to determine the volumes of non-hazardous and hazardous materials. The following table briefly summarizes the quantities of the major categories for each non-hazardous waste type. Approximately 355 m^3 of non hazardous material is located at the Roberts Bay site and 9 m^3 at the Ida Bay site. These total volumes include the containers (i.e. barrels) once they have been emptied of their contents. Based on the location and nature of these materials, all of the materials could be safely recovered without causing additional impacts to the surrounding environment. There were no contaminants or waste dumps in close proximity to water bodies where the remedial process will need to satisfy DFO requirements.

Summary of Non-Hazardous Wastes

Item	Roberts Bay Volume (m^3)	Ida Bay Volume (m^3)
Timber, scrap wood	92	5
Steel products	84	2
Other (domestic wastes, camp supplies, electrical equipment, wire, PVC pipe)	179	2
TOTAL	**355**	**9**

The following table presents a summary of the hazardous wastes and PCB containing wastes that were identified at the Roberts Bay site. No hazardous materials or PCB containing items were identified at Ida Bay.

Summary of Hazardous Wastes – Roberts Bay

Sample Location	Sample Description	Color	Volume (L)	Comments
Scattered around upper site	Open barrels	Light Brown	480	Open barrels containing petroleum products and water
Fuel Storage Compound	Liquid in fuel bladders		300 estimated	Liquid remaining in bladders
West and north of Garage		Brown	560	Motor oil
West of Garage		Blue	205	Glycol
Barrel Storage Shed		Clear	10	Partially full 5L plastic cans
Former Camp			50	Open barrels containing petroleum products and water
Former Camp				Partially full propane cylinder
Exploration Camp	Jet Turbo B		3,100	14 barrels
Exploration Camp	Heating oil		10	20 L metal container
Exploration Camp	Gasoline		80	4 plastic jerry cans
Exploration Camp			100	Open barrels containing petroleum products and water
Exploration Camp				Partially full propane cylinder
TOTAL			**4895 L**	

Inventory of PCB Containing Equipment

Item	Location	Comments
Capacitors	Mill	3 mounted on electrical panel, offsite disposal required
Light Ballasts	Total of 7 in Mill/Assay and Garage	Due to age, PCBs are suspected, offsite disposal required

During the waste audits, a number of liquid wastes were also identified at the site. These included glycol and motor oil in the vicinity of the garage, and jet fuel near the exploration camp, as presented in the Summary of Hazardous Wastes table (above). If the liquids were not easily identifiable (i.e. not clearly labeled), a sample was collected and submitted for laboratory analysis to determine discharge/treatment requirements. The glycol, located in a 205 L barrel west of the garage, was identified, as were the 14 sealed barrels of Jet Turbo B fuel near the exploration camp. Consequently the only liquid requiring laboratory analysis in order to determine it's suitability for to being burned onsite was motor oil. Laboratory results for this liquid identified it as a lube oil, with heavy metals and chlorine levels below applicable INAC barrel protocol levels therefore this material would be suitable for burning.

It is recommended that INAC try to establish the owner of the full fuel barrels at the exploration camp on the shore of Roberts Lake. In the event that the owner can not be contacted it is recommended that INAC remove the full barrels as soon as possible. It is also recommended that all PCB containing products, as well as the waste chemical products, be recovered and hauled to an approved offsite location for disposal.

The steel mill equipment (cone crusher, ball mill, tanks and floatation cells, tables, etc.) are painted with a product containing very high levels of lead. The NWT Government Environmental Guideline for Waste Lead and Lead Paint indicates that all substances with lead levels greater than 500 ppm lead are considered hazardous and therefore require proper handling and disposal. Based on the information in this document, it is recommended that the painted steel components be removed and hauled offsite for disposal, or that a lead abatement program be completed in order to remove the lead containing paint prior to disposal of the steel materials.

There currently exists a large amount of metal products located at the Roberts Bay mine site that have some amount of reuse potential. However, due to the high costs to transport the material, recycling may not be economically feasible. Earth Tech does not recommended that the metal frame tent structures be re-used or given to a local community for re-use due to the potential that they may be used in a manner that is not consistent with their original intended use. If these materials were donated to the local community it is recommended that the metal frames and trusses be cut and the material handed over as stock.

2.0 INTRODUCTION

Canada's north contains many federal contaminated sites. The Department of Indian and Northern Development (DIAND) is responsible through the Northern Contaminated Sites Program (CSP) to manage a number of contaminated properties that are no longer maintained by the original occupant. DIAND's inventory of contaminated sites in the northern territories originate from military, mining, and oil and gas activities. The Roberts Bay Silver Mine and the Ida Bay Silver Mine are two abandoned mine sites that are included in the inventory that DIAND is responsible for site and remediation. The following is the Earth Tech Site Assessment and Waste Audit Report based on field work completed between August 15 and August 22, 2005.

2.1 Background Information

The Roberts Bay Mine site is located on the south side of the Melville Sound, approximately 115 km southwest of the community of Cambridge Bay. The Ida Bay site is approximately 7 km northeast of the Roberts Bay site and is located on the shore of Melville Sound. The approximate coordinates of Roberts Bay are 68° 10' 45" N, 106° 33' 29"W and the site location is shown in Figure 1.0 and the general layout of the main portion of the site is presented in Figure 2.0 (Appendix A).

Based on the information presented in the report titled 'Preliminary Assessment of Robert and Ida Bay Mine Sites' prepared by Rescan Environmental Services Ltd. in 2003, the following is a brief historical summary of the two sites.

Roberts Bay

- Discovery of the silver deposit at in 1964
- Exploration activities until 1972
- Commencement of mining activities in 1973, by Hope Bay Mines, including the advancement of a 120 m long decline yielding 10 tons of hand sorted ore.
- 1974 expansion of Roberts Bay Mine with the construction of a 50-75 ton/day mill
- Closure of mine in 1975 after yielding a total of 74,500 ounces of silver in the form of direct shipping high grade ore and flotation concentrates.
- Additional exploration activities in the area of Roberts Bay have been ongoing since the 1980's.

Ida Bay

- Discovery of the deposit at Ida Bay in 1965
- Exploration activities until 1972
- Commencement of mining activities at Ida Bay in 1973 including the advancement of a 180 m long decline yielding 10,000 ounces of high grade silver.

2.2 Site Descriptions

2.2.1 Roberts Bay

The Roberts Bay site is approximately 1 km north of the western end of Roberts Lake and approximately 1.5 km east of Melville Sound. For this investigation, Roberts Lake was used as a landing site by a float plane. Access to the abandoned mine was achieved by following a road along a basaltic ridge that lead to the site, approximately 1 km north and 100 m higher in elevation than Roberts Lake.

The area around the site is dominated by the presence of a number of ridges and outcrops to the east and north. Surrounding the site and located between the ridges are numerous low/wet muskeg areas and small lakes and ponds. The majority of the developed areas of the site drain in a prominent drainage course to the south towards Roberts Lake. Some areas of the site (i.e. areas west of the camp dump) drain to the west.

The developments on the site consist of an adit, shaft, covered raise, tailings pond, waste rock piles, remains of the mill, assay and garage buildings, fuel storage compound, equipment storage areas, barrel storage shed, camp and dump area. A number of small debris piles are also located around the site. A small lake north east of the site was used as a water source. Large amounts of waste rock have also been used to level the operations areas of the site. The mill, assay and garage buildings were all constructed on waste rock pads. The Mill and Assay buildings contain much of the original ore process equipment, while scattered around the site are various types of used equipment, debris, equipment parts, and waste. The remains of an exploration camp are also located near the shore of Roberts Lake.

2.2.2 Ida Bay

The Ida Bay site is approximately 7 km north east of the Roberts Bay site and is located on the shore of small bay facing Melville Sound. For this investigation, the Ida Bay site was accessed with ATV's following a faint trail from the Roberts Bay site and via helicopter.

The only developments at the former Ida Bay mine site are an open adit, a partially covered vent raise, rock piles and scattered debris located around the site. Waste rock at this site was observed adjacent to the ocean and below the high tide level.

2.3 Previous Environmental Investigations

2.3.1 General

The following is a brief summary of the background reports that were available for review. Excerpts of these reports are reproduced in Appendix C. The scope of work for the 2005 investigation completed at the Roberts Bay and Ida Sites was based on the findings and conclusions of the 2003 Rescan Environmental Services Ltd. and the observations presented in the 1996 Vista Engineering Site Inspection Summary.

2.3.2 Vista Engineering Survey/Inspection

In 1986, Vista Engineering completed a survey/inspection of the Roberts Bay mine site. This inspection of the site produced a preliminary inventory of all abandoned waste materials including the quantities of potentially hazardous chemicals that were located in the remains of the buildings. Items of note that were observed at the site included drums of ore processing chemicals, floatation chemicals, lime, nitric acid, carbonate, lead acid batteries, lube oil, and 500 m of detonation cord. This inspection also indicated that the tailings pond was lined with polyethylene.

2.3.3 Preliminary Assessment of the Roberts Bay and Ida Bay Abandoned Mine Sites

Rescan Environmental Services Ltd. completed an assessment of both the Roberts and Ida Bay sites in 2003. The purpose of this assessment was to assess the stability of the mine workings, determine locations of waste rock piles and tailings areas, and determine the potential for acid rock drainage or metal leaching concerns.

Roberts Bay

This assessment concluded that there was no evidence of on-going acid rock drainage at the Roberts Bay site, however based on the analysis of a limited number of waste rock samples, this report indicated that there is a potential to generate acid drainage from some of the waste rock at this site. In addition, this report concluded that arsenic leaching may be a potential problem in the future based on the results of a leachable metal samples collected from the tailings pond. This report recommended that all waste materials at the site be collected and landfilled, all mine openings be securely closed and that additional studies be completed to determine if there are any impacts from the tailings impoundments and waste rock piles.

Ida Bay
This report recommended that closure measures be developed and implemented for this site and that additional investigation be completed to confirm that there have been no impacts from acid drainage and metals leaching. Additional recommended activities included the collection and disposal of all waste materials and all mine openings be securely closed.

2.3.4 Phase I/II Environmental Site Assessment Roberts Bay Mine and Ida Bay Deposit Nunavut

This report was prepared by Rescan Environmental Services in 2004 for Public Works Government Services Canada. This report restated the results from the previous 2003 and also included a Phase I/II ESA of both mine sites. The results from the Phase II ESA at the Roberts Bay site identified a total of 225 m^3 of hydrocarbon impacted soils in the vicinity of the mill, garage and around the fuel storage area. Elevated metal concentrations in soils were also encountered however, it was reported that these values were similar to the metal concentrations found in the waste rock piles. This assessment also estimated 305 m^3 of non-hazardous waste material at the site and hazardous materials were limited to barrels of fuel, oil, grease, compressed gas cylinders, lead acid batteries, one suspect electrical transformer and the unlabelled barrels located at the barrel storage area.

Based on the scope of investigative work completed at the Ida Bay site, no contaminated soil or water was identified at Ida Bay and only 8 m^3 of waste (non-hazardous) was identified at this site.

2.3.5 Screening Level Human Health Risk Assessment for the Roberts Bay and Ida Bay Mine Sites

This report was prepared by Senes Consultants Ltd. in 2004 for Indian and Northern Affairs Canada. The conclusions of this risk assessment were based on the information presented in the 2004 Phase I/II ESA of both sites prepared by Rescan Environmental Services. The screening level risk assessment included the following elements.

- Receptor characterization
- Exposure assessment
- Hazard assessment
- Risk characterization

This report summarized the screening level assessment for human health The risk assessment was undertaken to determine whether there are contaminant levels present that may have an adverse effect on humans.

2.4 Scope of Work and Objectives

Previous investigation activity has occurred at both the Roberts Bay and Ida Bay Mine Sites, the intent of this investigation program is to build upon the information obtained from the previous programs in order to allow for the development of a remedial plan for these sites.

The objectives of this environmental site assessment include the following:

- Assess water quality;
- Identify, characterize and quantify all hazardous and non-hazardous materials at the site;
- Identify and delineate areas of potential environmental concern at the site;
- Geophysical Assessment – geophysical assessment of potential dump sites and other disturbances;
- Investigate and delineate the dump and debris storage areas;
- Investigate borrow sources and possible landfill locations; and
- Increase community and Inuit involvement in the program.

In order to develop a remedial plan for both the Roberts Bay and Ida Bay sites PWGSC is required to complete further assessments at the two sites. The assessments include the following components:

- Geochemical and Mine Opening Assessment - completion of an investigation to determine methods to properly secure all mine openings and to determine if there are any impacts due to acid drainage or leaching of metals.
- Risk Assessment – completion of quantitative human health and ecological risk assessment based on the contaminated levels determined in the contaminant investigation program.
- Remedial Design – based on the results of all the above programs a remedial design will be completed.

The scope of work for the Earth Tech project was to conduct a contaminant assessment, a waste audit, geophysical and geotechnical assessments of the two sites as outlined in the Terms of Reference prepared by PWGSC-Environmental Services, Western Region. The scope of work included the development and implementation of a Site Specific Health and Safety Plan. Earth Tech was one of four engineering consultants who collected data during the field program at this site. The other consultants consisted of UMA Engineering (Risk Assessment), EBA Engineering who completed the geophysical assessment (sub-consultant to Earth Tech) and AMEC (Geochemical, Mine Opening Assessment and Site Survey).

This report presents the results of the waste assessment while the results from the contaminant and geophysical and geotechnical assessments are presented in separate bound reports.

3.0 EARTH TECH WORK COMPLETED

3.1 Methodologies

The following is a summary of the investigation protocols and methodologies, which were used during the completion of this assessment program.

3.2 Hazardous Materials Inventory

A waste audit was performed to inventory all hazardous and non hazardous materials on the site. This process involved measuring the dimensions of surfaces and piles, counting the quantity of like materials, assessing condition, and visual estimations of volumes. Materials included debris piles, barrels, concrete, steel structures, equipment parts, wood, glass and other debris noted on site. The survey included an assessment of all structures including wall, floor, and ceiling coverings, construction materials, and any items stored inside the structures. Potential hazardous materials include PCB containing equipment, mercury containing equipment, compressed gases and liquid products.

Once volumes were established, standard engineering tables would be used to determine weights per volume of specified material. To help support this detailed waste inventory, a complete photographic record of the entire site including all buildings and debris was made.

3.3 Building Material Survey

All structures onsite were examined by Earth Tech Civil Engineers. The project team also consulted with their own in-house structural engineers to confirm safe demolition methods or reuse potential. While the Earth Tech assessment team was onsite, the team also completed a designated substances survey of all the structures to determine items that require special handling or disposal methods. Items that were included in the survey were lead and PCB containing paint products, asbestos containing materials, batteries, detonation cord, and PCB containing equipment.

Specific sampling methodologies for these items are included below.

Asbestos

Samples were taken following an "adequately wet" procedure to prevent the release of fibers and respirators were dawned when sampling friable ACM. Samples were collected in sealed plastic bags, labeled accordingly, and the sample area sealed to prevent the release of additional fibers. Proper personal protective equipment was utilized when entering or sampling areas suspected to contain hazardous materials. All selected samples collected were placed in appropriate sampling containers for shipment to the analytical laboratory.

Lead/PCBs in Paint

Paint on building materials and equipment was sampled in order to determine lead and PCB content. Paint samples were collected with a utility knife or putty knife. Substrate materials, and suspected asbestos containing materials, were also recorded.

3.4 Dumps, Debris and Barrels

Dumps and Debris

All dumps and debris piles were examined in order to identify waste materials. In areas where there was the potential for waste materials to be buried, geophysical assessments were completed. The results of the geophysical assessments are presented in a separate bound report (Appendix A of the Earth Tech report Roberts Bay and Ida Bay Abandoned Mine Sites Geotechnical and Geophysical Assessment).

Barrel Sampling

The 1996 inspection identified a number of barrels that were located around the operations buildings at the site and their contents were determined. The purpose of this barrel assessment program was to obtain additional information on the barrel contents in order to determine disposal options and remedial cost estimates. Earth Tech was also able to open some of the barrels located in barrel storage in order to identify barrel contents.

Field sampling protocols for barrels, included looking for identification markings, dipping barrels/containers for volume and liquid types. Unknown liquids were measured utilizing the probe, dip sticks, disposable bailers and disposable drum samplers.

3.5 Health and Safety

A detailed Health and Safety Plan was prepared for this field program. A copy of this plan was submitted to PWGSC for their information and review. While onsite Earth Tech participated in a daily safety with all other field staff. Records of this meeting were kept by AMEC staff. Earth Tech staff also completed their own safety meetings and hazard assessments to meet internal company procedures.

4.0 RESULTS OF WASTE ASSESSMENT

4.1 General

Previous background reports for both the Roberts Bay and Ida Bay sites estimated volumes of hazardous and non hazardous materials. Non-hazardous materials were generally described as inert or dry material that could be left or disposed of on site and would not have a negative impact on the environment. Hazardous materials were generally described as wet, a liquid or leachable materials that if left on site, or not properly contained, may pose a threat to the environment.

The following sections present a brief description of the waste materials identified at each area of the site.

4.2 Fuel Storage Area

The main fuel storage compound was located in an area north of the adit, the storage system consisted of two rubber bladder tanks (15,000 L each) surrounded by a rock berm The berm was constructed with waste rock consisting of approximately 30 cm minus material. Plywood sheets and two layers of heavy duty poly (approx. 9 mil) were also located below the bladders and on top of the native materials. All of the piping associated with the bladders had been previously removed and treaded pipe connections were noted on the east end of the bladders. Field observations indicated that a small amount of liquid (potentially fuel or fuel/water mixture had collected at the lower end of the bladders. This volume was estimated at 300 L. Additional debris piles and scattered debris was noted around the shaft, former pumphouse, and in the level area north of the Mill and Adit entrance. Photos 1-8 (Appendix A) show some of the waste materials in this portion of the mine site.

4.3 Mill/Assay Buildings

The Mill/Assay building was the primary location where the ore material was processed. Based on the inventory of chemicals that were found at the site and from the equipment remaining in the mill, the silver was extracted from the ore using a floatation process. Equipment in the Mill consisted of ore process equipment (ball mill, tank, flotation cells, and electric motors). A large electrical panel was also located along the north wall of the Mill building. The panel was equipped with dry style transformers, various types of switch gear, and electrical cables of various gauges. Three capacitors labeled as containing PCBs were also located at the east end of the panel. Photos 9-20 show some of the waste material in the vicinity of the Mill and Assay buildings.

4.4 Barrel Storage Area

Located south of the Mill and tailings pond, is a wooden shed that is being used to store barrels of mill process chemicals, containers of grease and lead acid batteries (Photos 21-24). A number of barrels containing used ball mill balls as well as two wooden crates containing covered barrels were located on the north side of the shed. It is believed that these chemicals were gathered from various portions of the site and concentrated at this location in a recent clean up program at the site.

4.5 Garage Area

The former garage consisted of a simple metal framed/trussed building, immediately south of the adit. Remains of the cloth fabric used to cover the roof and walls of the building are scattered around the site. Used equipment is stored in areas west, south and east of the garage. Crushed waste rock was used to level the area surrounding the garage site. Waste materials consisting of vehicle and equipment parts, hoses, wire, hydrated bags of concrete mix, lumber, scrap steel, work benches, and an electrical panel were located inside the building. A steel tank (potentially used for fuel storage) was also located outside the south east corner of the building. Various types of waste materials electrical, equipment and vehicle parts including partially full barrels were also located outside the building. Photos 25-36 show some of the waste materials in the vicinity of the garage.

4.6 Camp Area

The former camp site is approximately 74 m downhill from the Mill building, as indicated on Figure 5. The Camp consisted of the remains of approximately 9 buildings. These buildings were used for bunkhouses, kitchen, and wash facilities. A large amount of scattered debris (wooden building remains, furniture, waste materials is littered and windblown around the site. Immediately west of the camp is a small dump surrounded with a waste rock berm. Waste materials observed in the dump included rusted tin cans, glass bottles, and burned wastes. Photographs of the former camp and dumpsite are presented in Photos 37-40.

4.7 Roberts Lake Area

Wastes identified in the area of Roberts Lake included, scattered lumber, the remains of a former exploration camp, pile of core boxes, barrels of Jet Fuel as well as approximately 100 empty fuel barrels in a second barrel cache. Photos 37-39 show some of the waste materials at the Roberts Lake area.

4.8 Ida Bay Area

The waste materials at the Ida Bay site consisted of a small volume of lumber, miscellaneous steel/metal, lead acid batteries, rubber hose products and a small pile of domestic wastes. Photographs 40-49 show some of the waste debris that is scattered around the Ida Bay site.

5.0 HAZARDOUS MATERIALS/BARREL INVENTORY

Roberts Bay Hazardous Waste

The hazardous material survey at the site consisted of the following items;

- examination of barrels to determine contents and quantities,
- inspection of scattered debris to confirm the presence of hazardous materials.

The 1996 Vista Engineering inspection report identified a number of potentially hazardous materials at the Roberts Bay Mine site. Included in the 1996 report were the following items (a copy of the 1996 inspection report is included in Appendix C).

- 6 barrels of ore processing chemicals (xanthanate)
- Dowfroth 1012 Floatation Frother
- Bags of High Calcium process agent
- Drum of lime
- 6 L of hydrochloric acid
- 4.5 L of nitric acid
- Lead shavings
- Carbonate
- Lead acid batteries
- Stained vercumulite

- Tar
- Lubricating oil
- 500 m of detonation cord

Based on the observations made of the site in 1996 and the condition of the site in 2005, the bulk of the potentially hazardous materials at the site have been collected and consolidated in containers currently stored at the barrel storage area. Earth Tech was able to open some of the sealed containers and found that they contained containers of clear liquids, bags of vermiculite, and dry powder materials. Earth Tech has not been able to confirm if any of the hazardous materials (including 500 m of detonation cord) had been removed from the site since 1996, therefore it should be assumed that the complete inventory of hazardous materials identified in 1996 remain at the site.

During the completion of the barrel sampling program, Earth Tech identified a number of barrels in the area west of the Garage and extending towards the north. These barrels were typically open and contained small volumes of oily water. Located east of the garage, were six partially full red and white barrels that contained a thick oily product. This product was visually very similar to new motor oil and a sample was submitted to a laboratory for further chacterization. The characterization of this sample (ET-01) confirmed that it contained a lube oil concentrated in the C40 carbon range however this sample also had a component in the lighter C15 and lighter Carbon range. A copy of the laboratory chromatograph for this sample is reproduced in Appendix D. The sample was also submitted for laboratory analysis and results for heavy metals (cadmium, chromium and lead) and chlorine analysis are provided in the table below. As indicated in the table, all results were below applicable barrel clean-up protocol therefore this oil should be suitable for burning onsite.

Summary of Results for Motor Oil Analysis

Parameter	Barrel Protocol (ppm)	ET-01 (ppm)
Cadmium	2	< 0.5
Chromium	10	< 0.5
Lead	100	< 5
Chlorine	1000	140

One additional barrel (painted green and white) was also located east of the garage, a sample of this barrel was visually identified as containing glycol. At the exploration camp, near Roberts Lake, fourteen full barrels labeled as containing Jet Turbo B additional were abandoned. These labels on these barrels indicated that the contents expired in July 2004 indicating that they barrels had likely been left at the site within the last couple of years. Samples from the glycol barrel or the Jet Fuel were not submitted for further analytical testing.

The following table presents a summary of the liquid materials that were identified during the investigation at the site. In total 4,755 L of liquids were identified at the site.

Summary of Hazardous Waste – Roberts Bay

Sample Location	Sample Description	Color	Volume (L)	Comments
Scattered around upper site	Open barrels	Light Brown	480	Open barrels containing petroleum products and water mix
Upper site	Compressed Gas Cylinders			7 various colors and sizes
Upper site	Lead acid batteries			2
Fuel Storage Compound	Liquid in fuel bladders		300 estimated	Liquid remaining in bladders
Mill building	Yellow cabinet			Made with asbestos containing transite panels
West and north of Garage		Brown	560	Motor oil
West of Garage		Blue	205	Glycol
Barrel Storage Shed				205 L drum filled with lead-acid truck batteries
Barrel Storage Shed				Various wastes stored in 8 overpack drums and 9 other drums
Barrel Storage Shed		Clear	10	Partially full 5L plastic cans
Former Camp	Compressed Gas Cylinders			Two cylinders, one partially full propane cylinder
Exploration Camp	Jet B		3,100	14 barrels
Exploration Camp	Heating oil		10	20 L metal container
Exploration Camp	Gasoline		80	4 plastic jerry cans
Exploration Camp	Compressed Gas Cylinders			Partially full propane cylinder
Total Volume of Liquids			**4,755 L**	

Ida Bay Hazardous Wastes

The only potentially hazardous material that was observed at the site consisted of a small number of broken open lead acid batteries also located in the former camp area.

Summary of Hazardous Wastes – Ida Bay

Item	Approx. Volume (m^3)	Estimated Weight (kg)
Hazardous Wastes		
Broken lead acid batteries	0.25	100 kg

6.0 BUILDING MATERIALS SURVEY

6.1 Lead/PCB Containing Paint

Building inspections were completed to confirm the presence of any hazardous building materials (i.e. asbestos, mercury containing, or PCB containing). Due to the exposed nature of the materials at the Roberts Bay site, the painted surfaces were very weathered and paint was no longer present. However, two paint samples were collected from the equipment in the Mill/Assay building. These samples were collected from a light blue tank (Photo 13) and from the green concentration tables (Photo 10) in the Assay building. Both of these samples were analyzed for PCB and lead content as well as lead leachate generation using the TCLP process. Due to the high lead concentration all mill equipment painted with blue and green paint should be removed in the event the materials are landfilled on site since they are considered hazardous by NWT regulations.

Summary of Paint Analysis

Sample Location	PCB Content (ppm)	Lead (ppm)	Leachable Lead (mg/L)	Color	Substrate
Tank in Mill	0.3	28,100	<0.5	Blue	Steel
Table in Assay	<0.3	12,200	<0.5	Green	Steel

6.2 PCB Containing Equipment

There were a number of electrical transformers identified onsite (mill, garage and camp) however all of these transformers were of the dry style and therefore did not contain dielectric fluids. Identified PCB containing equipment was limited to 3 capacitors (labeled as PCB containing) attached to the electrical panel in the Mill (Photo 16) and to a total of 7 ballasts used in the overhead lighting in the Mill/Assay and Garage buildings.

Summary of PCB Containing Equipment – Roberts Bay

Location	Item	Number	Estimated Weight (kg)	Estimated Volume (m3)
Mill Electrical Panel	Capacitors	3	30	0.1
Mill, Assay and Garage	Light Ballasts	7	8	0.05

6.3 Asbestos

Asbestos materials on site were limited to a transite panel constructed heating cabinet in the mill (Photo 19). A sample of the transite panel was not submitted for analysis however transit panel materials typically contain between 2% and 10% chrysotile asbestos. The only other asbestos containing items that were observed was a couple of potentially asbestos containing brake pads located at both the Ida Bay and Roberts Bay sites.

7.0 DUMPS AND DEBRIS

Non Hazardous Material is reported in crushed volumes and is assumed that simple demolition procedures will be used to obtain these volumes (e.g. crushing with excavator bucket or crushing in landfill with bull dozer, torch cutting of large steel items etc.). The summary tables in Appendix B (Tables 1 and 2) present a detailed summary of the waste audit that was completed at the Roberts Bay and Ida Bay Mine Sites.

Roberts Bay

A large amount of inert debris is scattered around the Roberts Bay site. The bulk of the waste material is concentrated around the former camp site as well as the Mill and Garage buildings. Minor amounts of windblown debris were also identified in areas surrounding the site. In total 355 m^3 of non-hazardous materials were estimated at the site. One small dumpsite had been identified below the former camp site, an examination of this dump indicated that it only contained a small volume of domestic waste (mainly cans, glass and wood) on top of the ground surface. Field observations also indicated that some of this waste material had been burned in place. There were no signs that waste materials had been buried at this dump. The following table presents an abbreviated summary of the waste materials identified at the Roberts Bay site.

Summary of Non-Hazardous Wastes – Roberts Bay

Item	Volume (m^3)
Timber, scrap wood	92
Steel products	84
Other (domestic wastes, camp supplies, electrical equipment, wire, PVC pipe)	179
TOTAL	**355**

Ida Bay

The waste materials at the Ida Bay site consisted of a small volume of lumber, and miscellaneous steel/metal and rubber products. A total of 9 m^3 of waste materials was estimated to be present at the Ida Bay site with approximately 5 m^3 estimated to be wood materials. A small pile (0.5 m^3) of domestic waste (rusted tin cans) was observed in the former camp area.

Summary of Wastes – Ida Bay

Item	Volume (m^3)
Non-Hazardous Wastes	
Timber, scrap wood	5
Steel products	2
Other (tin cans, camp wastes)	2
TOTAL	**9**

8.0 WASTE DISPOSAL OPTIONS

The following table presents a summary of the waste disposal options for each waste type found at both the Roberts Bay and Ida Bay mine sites. For some of the items, more than one option has been presented. The cost estimates assume that suitable equipment and labor forces are already at the Roberts Bay site therefore mob/demob and living expenses have not be included in the costs estimate.

Summary of Waste Disposal Options and Costs

Category	Waste Stream	Quantity	Estimated costs	Comments
Roberts Bay Non-Hazardous				
	Wood	92 m^3	$5,000	Collection and burn onsite, need to confirm permit requirements
	Steel and metal products	84 m^3	$140,000	Collection of waste materials and construction and placement of waste in an onsite landfill.
	Misc. inert wastes	178 m^3	$16,500	Collection and disposal in on site landfill, landfill constructed in previous item. If possible dispose of inert wastes in mine openings in order to reduce the size of constructed landfill.
	Asbestos	0.5 m^3	$3,000	Collection and disposal in on site landfill with signage

Category	Waste Stream	Quantity	Estimated Costs	Comments
Roberts Bay Hazardous				
	PCB Containing Items	0.25 m^3	$5,000	Collection, haul and disposal at Swan Hills
	Fuel Products (gasoline and Jet Fuel)	3,200 L	$5,000	Incinerate onsite
	Hydrocarbon impacted water in bladders/barrels	800 L	$2,500	Treat water and onsite disposal
	Waste Oils/Glycols	675 L	$1,500	Mixed with fuel at a proper rate and incinerate onsite
	Compressed gas cylinders	10	$1,000	Collect and vent, disposal of empty cylinder in landfill
	Mill Process Chemicals		$5,000	Hauling and off site disposal at an approved waste disposal facility
	Acids		$500	On site neutralization and disposal
	Equipment painted with lead amended paint	11,000 kg	$18,000	Removal of non-painted surfaces to reduce weight, and offsite disposal of painted materials as non hazardous material in Alberta
			$30,000	Removal of lead paint and disposal as non hazardous material in onsite landfill. Complete removal of all paint may not be possible without sand blasting. Offsite disposal of removed paint and removal agents
			$45,000 plus ongoing landfill monitoring	Disposal in a separate onsite hazardous waste disposal cell
	Lead acid batteries	0.25 m^3	$1,500	Collection, offsite disposal
	Detonation Cord		$1,000	On site neutralization/stabilization and disposal
Ida Bay Non-Hazardous				
	Wood	5 m^3	$1,000	Collection and burn onsite
	Steel and inert camp wastes	4 m^3	$1,000	Collection and bury in adit
Hazardous				
	Lead Acid Batteries	0.25 m^3	$1,000	Collection and disposal with batteries from Roberts Bay

9.0 SUMMARY OF WASTE ASSESSMENT

A detailed Waste Audit was completed to in order to determine the volumes of non-hazardous and hazardous materials. Approximately 355 m^3 of non hazardous material is located at the Roberts Bay site and 9 m^3 at the Ida Bay site. Based on the location and nature of these materials, all of the materials could be safely recovered without causing additional impacts to the surrounding environment and there were no contaminants or waste dumps in close proximity to water bodies where the remedial process will need to satisfy DFO requirements.

It is recommended that INAC try to identify the owner of the full Jet fuel barrels at the exploration camp on the shore of Roberts Lake. In the event that the owner can not be contacted it is recommended that INAC remove the full barrels as soon as possible. It is also recommended that all PCB containing products as well as the waste chemical products be recovered and hauled to an approved offsite location for disposal.

The steel mill equipment (cone crusher, ball mill, tanks and floatation cells, tables, etc.) are painted with a product containing very high levels of lead. The NWT Government Environmental Guideline for Waste Lead and Lead Paint indicates that all substances with lead levels greater than 500 ppm lead are considered hazardous and therefore require proper handling and disposal. Therefore based on the information in this document, it is recommended that the painted steel components be removed and hauled offsite for disposal or a lead abatement program be completed in order to remove the lead containing paint prior to disposal of the steel materials.

There are currently a large amount of metal products located at the Roberts Bay mine site that have some reuse potential. However, due to the high costs to transport the material, recycling may not be economically feasible. Earth Tech does not recommended that the metal frame tent structures be re-used or given to a local community for re-use due to the potential that they may be used in a manner that is not consistent with their original intended use. If these materials were donated to the local community it is recommended that the metal frames and trusses be cut and the material handed over as stock.

10.0 CLOSURE

The usage of this report is limited by the standard Earth Tech Special Provisions – Environmental Site Services, which are included in Appendix E of this report.

APPENDIX A

PHOTOGRAPHS

Photo 1: Debris and fencing around former shaft

Photo 2: Remains of pumphouse at lake

Photo 3: Scattered debris north end of site

Photo 4 Debris pile near Mill

Photo 5: Debris around coarse ore hopper

Photo 6: Debris near Assay Building, crusher in background

Photo 7: Barrels between Garage and Assay Building

Photo 8: Gas cylinders near cone crusher

Photo 9: Equipment in Assay Building

Photo 10: Concentration Tables and Equipment in Assay

Photo 11: Equipment in Assay Building

Photo 12: Ball mill and conveyor from hopper, Mill Building

Photo 13: Thickener tank and flotation cells, Mill Building

Photo 14 Debris and equipment in Mill

Photo 15: Main electrical panel in Mill

Photo 16: Three PCB containing capacitors in Mill

Photo 17: Looking east into Mill

Photo 18: Floatation cells and debris in Mill

Photo 19: Heated cabinet in Mill, asbestos materials

Photo 20: Fine ore hopper, west of Mill

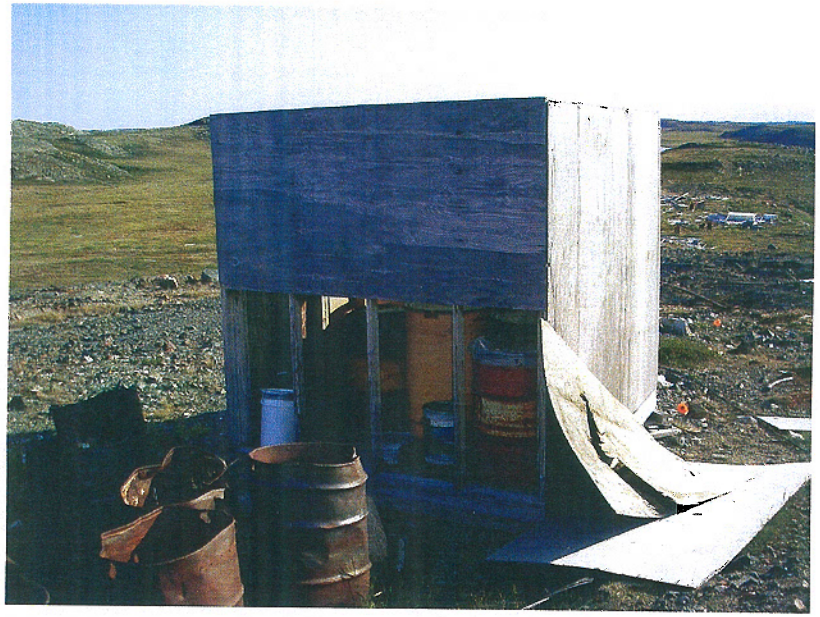


Photo 21: Barrel storage shed

Photo 22: Overpack barrels and misc. containers in shed

Photo 23: Overpack drums and lead acid batteries in shed

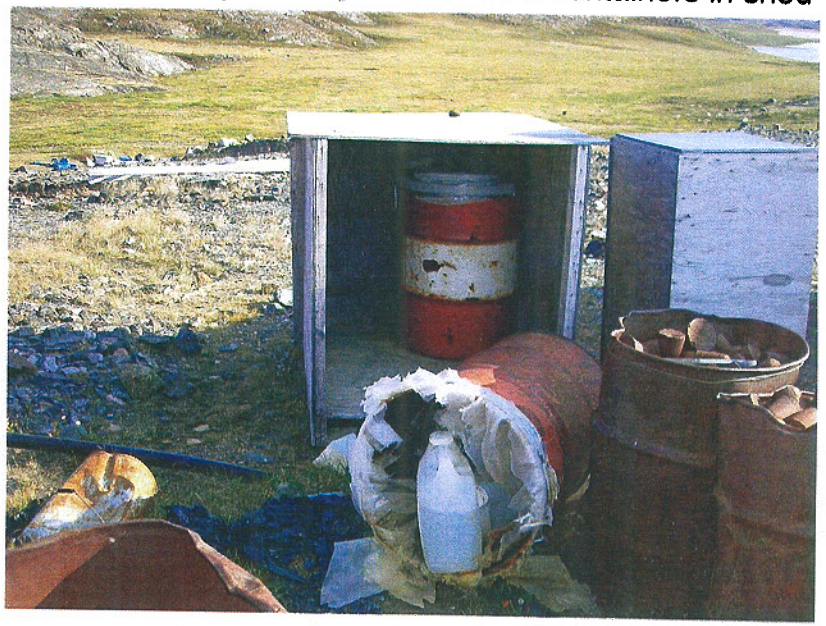


Photo 24: Drums containing recovered liquids and dry chemicals

Photo 25: Fencing and debris around adit entrance

Photo 26: Looking south through Garage Building

Photo 27: Equipment parts and concrete in Garage

Photo 28: Looking east into Garage

Photo 29: Dry transformer and electrical panel in Garage

Photo 30: Debris and steel tank outside Garage

Photo 31: Hose products west of Garage

Photo 32: Debris east of Garage

Photo 33: Waste materials east of Garage

Photo 34: Waste materials east of Garage

Photo 35: Drums near Garage

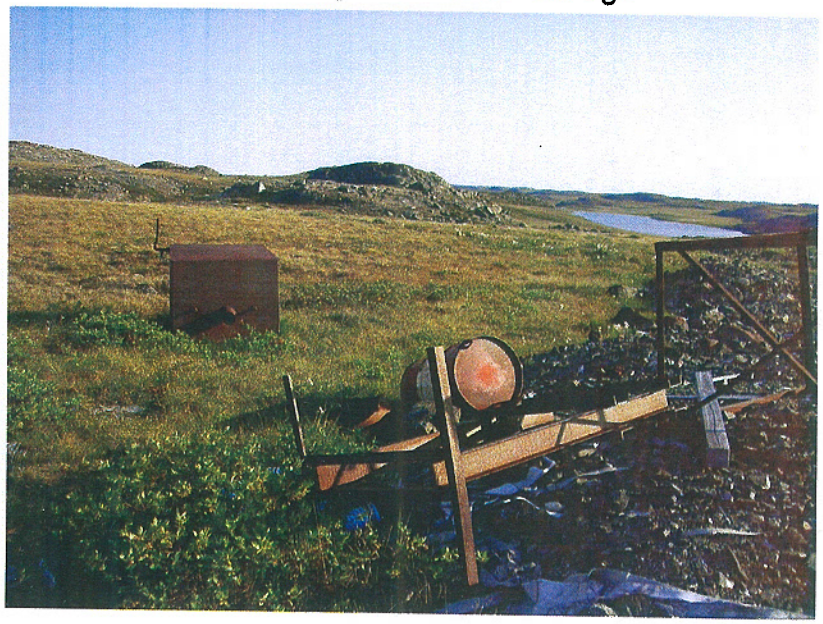


Photo 36: Waste materials east of Garage

Photo 37: Buildings remains at former Camp site

Photo 38: Propane cylinders and debris at former Camp site

Photo 39: Waste debris at Camp site

Photo 40: Core boxes and debris and former Camp site

Photo 44: Waste debris west of adit

Photo 45: Waste debris at Ida Bay site

Photo 46: Waste timbers at Ida Bay

Photo 47: Scattered debris at Ida Bay site

Photo 48: Adit entrance

Photo 49: Waste rock along Ida Bay shoreline

Photo 50: Waste debris at Ida Bay

Photo 51: Covered raise at Ida Bay site

Photo 52: Waste lead acid batteries at camp site

Photo 53: Pile of tin cans at former camp site

APPENDIX B

WASTE AUDIT SUMMARY TABLES

Table B-1 Summary of Waste Materials
Roberts Bay Mine Site

Site Name	Non-Hazardous Waste Items	Comments	Non Hazardous Volume m^3	Hazardous Volume m^3	Estimated Weight kg
Water Lake Pumphouse and area of Shaft	**NON-HAZARDOUS**				
	Scattered wood debris	Partially submerged below water	1		225
	electical cable to Mill area		2		1000
	rubber hose in water		0.5		100
	small electrical panel at pumphouse		0.25		280.75
	Plastic pipe and fittings to Mill area		5		2250
	plastic pipe		1		450
	electical cable		1		450
	scattered wood debris		5		1125
	chain link fence		3		250
	corregated steel sheets		0.5		100
North of Fuel Storage Bladders and east of road	**NON-HAZARDOUS**				
	PVC pipe and fittings		5		2250
	Scattered wood pieces		2		450
	small heavy duty rubber bladders	potentially used for water storage	0.5		1500
	steel tray and scrap pieces		1		1123
	empty barrels	12	1.8		505.35
	core boxes		1		225
	rubber conveyor belt		0.5		100
	HAZARDOUS				
	2 - lead acid batteries (24 volt)			0.25	100
North of Mill Building west of road	**NON-HAZARDOUS**				
	PVC pipe and fittings		6		2700
	Scattered wood pieces		5.5		1237.5
	empty barrels	29	4.35		725
	large rubber tire		0.5		125
	steel pipe and scrap pieces		5		5615
	cone crusher on skids		2		2500
	2- small steel and wood hoppers		1.5		750
	2 wooden boxes with steel frame		0.75		500
	coarse ore hopper - steel		1		1750
	coarse ore hopper - wood		4		200
	electrical wire	50 mm and smaller diameters	1		1000
	rubber hose		1		450
	green steel truss		0.75		881.25
	Fine ore hopper - wood		3		500
	Fine ore hopper - steel		2		1000
	HAZARDOUS				
	7 compressed gas cylinders	various sizes			200
Fuel Storage Area	**NON-HAZARDOUS**				
	2 rubber bladders		18		4500
	rubber tires		1.5		375
	plywood base		3		750
	PVC pipe and rubber hose		0.5		125
	plastic liner below plywood	9 mil ploy	1		50
	HAZARDOUS				
	Liquid remaining in fuel bladders	300 L estimated		300 L	300
Adit	**NON-HAZARDOUS**				
	steel truss roof		5		5615
	chain line fence		4		4492
	scattered wood		2		450
	scattered pipe and steel pieces		3		3369
	PVC pipe and fittings		0.5		225
	remains of fabric roof		0.5		100
Garage and storage area to the east	**NON-HAZARDOUS**				
	steel truss roof		4		4492
	PVC pipe and air hose		3.5		1575
	Scattered wood pieces		5		1125
	concrete		3.5		8400
	large rubber tire				300
	steel pipe, tank and scrap hardware and pieces	inside garage	4		4492
	remains of fabric roof		3		200
	fire extinguishers, air filters		0.2		200
	electrial panel-switch gear, motor	dry style electrical transformer	0.5		500
	electrical wire		0.5		250
	pile of scrap wood		4		900
	rubber tires		6		500
	narrow gauge rails and pipe		1		500
	steel tanks and frame		1.5		1250
	empty barrels	14 - 205 L	2.1		350
	empty small drums	6 - 20L	0.3		200
	rubber bladder		0.5		250

Table B-1 Summary of Waste Materials
Roberts Bay Mine Site

Site Name	Non-Hazardous Waste Items	Comments	Non Hazardous Volume m^3	Hazardous Volume m^3	Estimated Weight kg
	misc. scattered steel parts and equipment		3.5		3930.5
	wooden spool		0.5		150
	HAZARDOUS				
	asbestos brake pad	one observed in storage area			5
	10 L of waste oil, can of WD-40	in wooden box west of garage		10 L	5
	2 electrical transformer ballasts	Suspected PCB containing due to age			8
	used oil filters	scattered around garage area			15
Mill/Assay Building	**NON-HAZARDOUS**				
	steel truss roof		6		6738
	remains of fabric walls and roof		2		300
	Steel conveyor		2		500
	Ball Mill	contents unknown	4		3000
	Jig (north of ball mill)		2		750
	Electrical panel/switch gear		1.5		500
	Wire	various diameters	5		1500
	PVC Pipe products		4		1800
	motors/pumps		2		2240
	tank		1		1250
	floatation cells		4		4492
	empty barrels- 205 L	5	0.75		125
	lumber and scrap wood		3		675
	scrap metal		2		2246
	2 barrels of steel balls		2		1500
	Misc. waste debris		3		1500
	wood in framework		3		675
	steel framework for ceiling and walls		3		1500
	PVC pipe and fittings		0.5		225
	glass rods		0.25		100
	electrical wire		0.5		500
	steel constructed equipment, green tank and pump		2.5		1500
	furnace and electrical equipment		0.5		561.5
	wood floor, counters and scrap pieces		5		1125
	bundles of burlap bags		4		900
	Cable and hose to the east of Assay Building		1		450
	Steel Debris to the east of Assay Building		3		3369
	Wood debris east of Assay Building		2		450
	HAZARDOUS				
	3 capacitors on electrical panel	Labelled as containing PCBs			30
	asbestos insulated cabinet	painted yellow			250
	5 electrical transformer ballasts	Suspected PCB containing due to age			20
Barrel Storage Shed	**NON-HAZARDOUS**				
	Wooden shed		3		675
	6 barrels with mill balls		2.5		2807.5
	PVC pipe west of tailings pond		0.5		225
	wood west of tailings pond		0.5		112.5
	HAZARDOUS				
	1-205 L drum in separate wood crate	Crate is sealed			150
	1- 205 L drum full of lead acid batteries				250
	1-205L drums plastic cover, not labeled				200
	2-205L drums plastic cover, not labeled	in seperate wood crate, contains some liquids		20	400
	1- 20 L plastic pail, not labeled				25
	1-20 L steel pail, not labeled				25
	2- 10L steel pails, not labeled				15
	8- overpack drums	labelled as poisonous			2250
Camp Area/Dump	**NON-HAZARDOUS**				
	empty barrels	21	3.15		315
	toilet bowl		0.15		25
	wood		36		8100
	remains of cloth tents		2.5		500
	domestic waste, tin cans, glass, lino, wire		1.25		250
	small antenna		0.5		561.5
	metal heaters and duct work		0.5		280.75
	General Camp Debris (stoves, hot water tank				
	deep freeze, shower stall, kitchen supplies,				
	water tank, wheel barrow, tables, wire, pipe				
	water pump, sinks, washing machine)		46		34500
	electrical panel/switch gear, wire	dry style transformer	1		750
	burlap bags		5		1125

Table B-1 Summary of Waste Materials
Roberts Bay Mine Site

Site Name	Non-Hazardous Waste Items	Comments	Non Hazardous Volume m^3	Hazardous Volume m^3	Estimated Weight kg
	waste materials visible in dump	partially burned	3		600
	rubber belt		0.5		225
	HAZARDOUS				
	propane cylinders	one partially full			50
	12 V car battery				20
	205 L barrels partially full of water	80 L of water with minor amount of fuel		80 L	80
Barrels between Assay Building and Adit	**HAZARDOUS**				
	205 L glycol	one barrel painted green and white		205 L	200
	barrels with water and hydrocarbons	barrels scattered around site		420 L	420
	205 L barrels with oil (very similar to motor oil)	red and white painted		550 L	550
Exploration Camp on the shore of Roberts Lake	**NON-HAZARDOUS**				
	wooden core boxes and core	west of dock area	5		1125
	empty barrels - 6	west of dock area	0.9		90
	empty barrels - 110	dock area	16.5		1650
	camp wastes - tin cans, fabric, rubber hose	dock area	2		786.1
	lumber	dock area	3		675
	HAZARDOUS				
	propane cylinder	partially full			25
	14 barrels full Turbo Fuel B, 205 L each	dated 3/6/98		3100 L	3100
	1 -20 L drum	approx. 10 L of heating oil		10 L	5
	4-20 L plastic jerry cans of gasoline			80 L	100

Summary of Wastes

Non-Hazardous Wastes	Volume (m^3)	Weight (kg)
Wood	92.3	20325.0
Steel/metal	84.3	73534.9
Other	178.4	88638.4
Total	**355**	**182,498**

Hazardous Wastes	Volume (L)	Weight (kg)
Liquids	4755	
Solids		4083
Total	**4,755**	**4,083**

Table B-2 Summary of Waste Materials
Ida Bay Mine Site

Site Name	Non-Hazardous Waste Items	Comments	Non Hazardous Volume m^3	Hazardous Volume m^3	Estimated Weight kg
Ida Bay Site	**NON-HAZARDOUS**				
	Scattered wood debris, lumber, plywood		5		1125
	steel pipe, cables, wire, steel rails, barrel		2		2246
	rubber hose		0.5		50
	tin cans	camp area	0.5		30
	various auto and equipment parts		1		1000
	HAZARDOUS				
	lead acid batteries	batteries broken open in camp area	0.5		100

Non-Hazardous Wastes	Volume (m^3)	Weight (kg)
Wood	5.0	1125
Steel/metal	2.0	2246
Others (misc. equipment and parts)	2.0	1080
Total	**9**	**4451**

Hazardous Wastes	Volume (L)	Weight (kg)
Solids (broken lead acid batteries)		100
Total		**100**

APPENDIX C

EXCERPTS FROM REFERENCE REPORTS

The 1996 Vista Engineering survey/inspection yielded the following information as to the conditions at the Roberts Bay Mine Site.
In terms of camp-building infrastructure, all buildings were/are wood-framed, wood floored, and had/have partial plywood walls. Insulation is scattered in and amongst the buildings, there is scrap wood, tarp remnants, furniture, and 15 - 205L fuel drums scattered about. Buildings observed include:

- 10 tent frames
- Outhouse:
  - Wood frame
  - Porcelain toilet
  - Below is a 205L drum, ¾ full of sewage
- Shed:
  - Plywood roof
  - Wired for electricity
  - 4 rolls of fiberglass insulation attached to tarpaper
  - 6 large burlap bag bundles
- Kitchen:
  - Collapsing
  - Linoleum covered floor
- Washroom:
  - Linoleum covered floor
  - Hot water heater (x2)
  - 3 sinks
  - Water tank
  - Propane stove
  - Electric Fridge
- Dining Room:
  - Only floor remains
- Bunkhouse (x3):
  - Poor condition
- Bunkhouse:
  - Only floor remains
- Bunkhouse:
  - Collapsed
  - 3 Oil furnaces adjacent
- Bunkhouse:
  - Nearly collapsed
  - Scattered insulation
  - Metal cot

Other infrastructure buildings are:

- Mill:
  - Stable, steel framed
  - Ball-mill on skids
  - 7 floatation cells
  - Collapsed electrical panels

- Dry-type transformer
- Metal storage cabinet, empty
- 6 – 205L drums with processing chemicals inside
- 2 – 105L drums, ½ full of xanthanate
- 1 – full, 105L xanthanate drum
- 1 – drum, 1/10 full of "Pine Oil"
- 1 – drum, ¾ full of "Dowfroth 1012 Floatation Frother"
- 1 – 205L drum with release valve, xanthanate solution

- Assay lab:
  - Steel framed, sound
  - Partial plywood walls
  - Kiln
  - 2 – shaker tables
  - Crucibles
  - Ore samples
  - Burlap sacks
  - 6 – bags, "High Calcium Sno-White Process Agent"
  - 20L cardboard drum of lime
  - 2 – 3L glass jar of HCl Vermiculite in a plastic garbage bag
  - 3L broken glass jar of Nitric acid, stored in vermiculite in a plastic bag
  - 3L jar of Nitric acid, ½ full
  - 20L pail of lead shavings
  - 20L pail of carbonate
- Adit Vestibule:
  - Steel-frame
  - Tarp-covered (partially intact as of 1997)
  - Vestibule covers entrance to the flooded adit
- Shop:
  - Stable, steel framed
  - 2 – charged fire-extinguishers
  - 6 – lead-acid batteries
  - 2 – 20L drums containing stained vermiculite
  - 10L leaking pail of tar
  - 20L barrel containing "Essolube" lubricating oil
  - 6 – broken bags of high-calcium processing agent
  - ~500m of detonation cord
  - Misc. scrap metal and hardware
- Vent Shack:
  - Wood-framed, stable but beginning to deteriorate
  - Covers vent
- Pump House:
  - Wood framed
  - Partially submerged in a small pond
  - 100m rubber hose and 40m electrical wire stretching towards the mine site
- Hoppers:
  - #1 – Fine Ore Hopper:

        - Steel framed
        - Plywood walls
        - Concrete foundation
        - Empties onto conveyor belt that leads to the mill
    - #2 – Coarse Ore Hopper:
        - Steel framed
        - Plywood walls
        - Surrounded by a waste rock pile, which has been graded to form a ramp to dump ore.
        - Cone crusher is adjacent
    - #3:
        - Steel framed
        - In rubbish pile

Other debris and hazards include:

- Artifacts, Metal Debris, and Solid Waste:
    - Empty 205L drums
    - Metal Pipes
    - Rubber Hose
    - Wood
    - Insulation
    - Disseminated metal debris
    - 10 empty pressurized tanks, with holes in the sides
    - 10 – 205L drums with spent iron balls inside
    - 1 defined disposal site:
        - 10 tractor tires
        - 100m of electrical wire
        - 100m of 5cm rubber hose
        - Rubber fuel bladder
        - Scrap metal
- Shaft:
    - Rock-filled
    - Stability and depth unknown
- Waste Rock:
    - Unlikely to produce acid because neutralizing potential exceeds acid producing potential
- Exploratory Trenches:
    - 5
    - Harmless
- Tailings:
    - Lined with polyethylene
    - Surrounded by a 1m high aggregate berm
    - 1m deep near outlet pipe
    - Exceeds CCME Remediation Criteria for Soil with respect to:
        - Arsenic

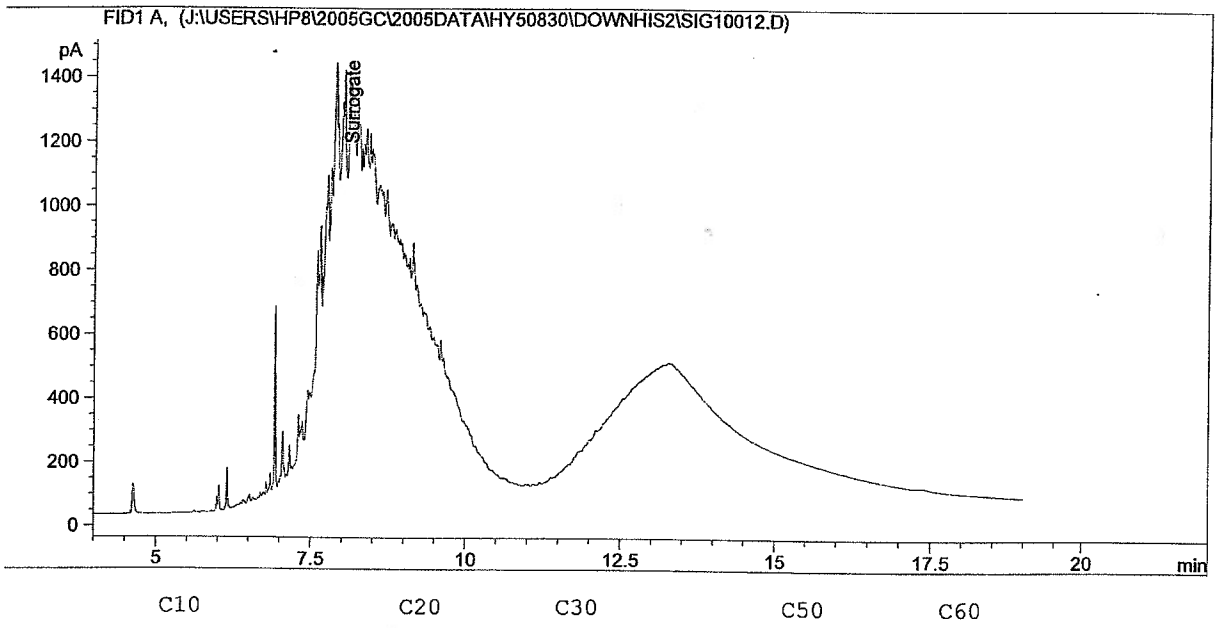
        - Barium
        - Nickel
        - Thallium
- Petroleum Products:
    - 190 – 250L drums, empty (100 at the disposal site, rest scattered)
    - 20L full barrel of "Essolube" (in shop)
    - 2 empty fuel bladders, surrounded by a plastic lined aggregate berm
- Miscellaneous:
    - 2 Xanthanate drums:
        - Open
        - High in salts:
            - Potassium
            - Sulfate
            - Chloride
            - Carbonate
        - Alkaline
        - Conductive

APPENDIX D

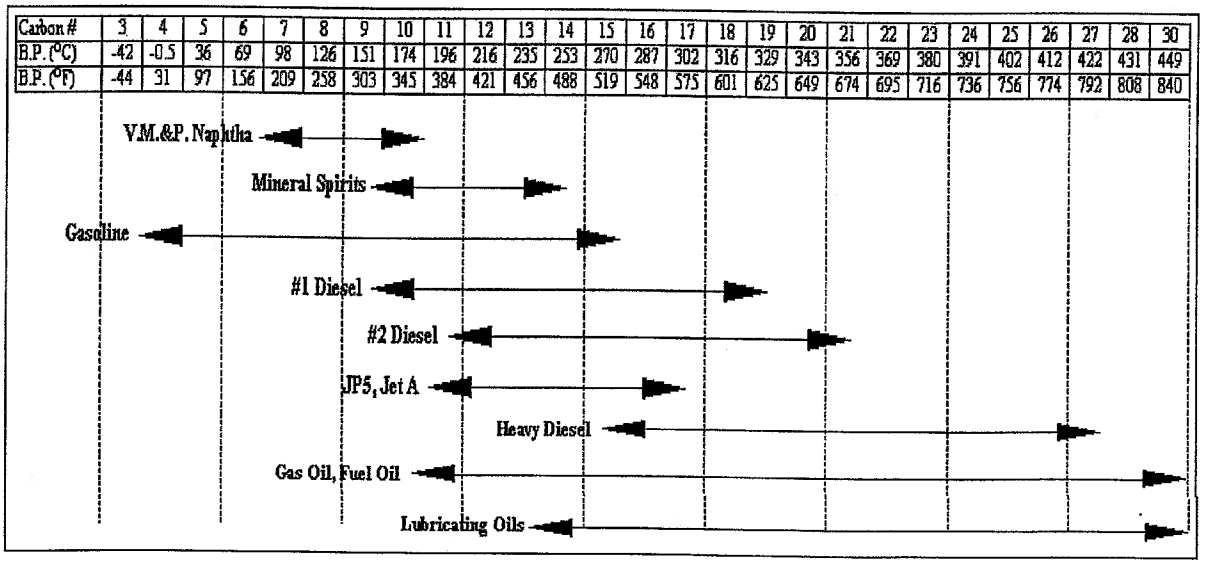
LABORATORY REPORTS

Client ID: ROBERTS BAY ET-01 ROBERTS BAY BARREL SAMPLE

Sample ID: L309982-22 prod
Injection Date: 8/30/2005 8:13:49 PM
Injection Time: 8/30/2005 8:13:49 PM
Instrument ID: Instrument 1
Operator: organics



Boiling Point Distribution Range for Petroleum Based Fuel Products



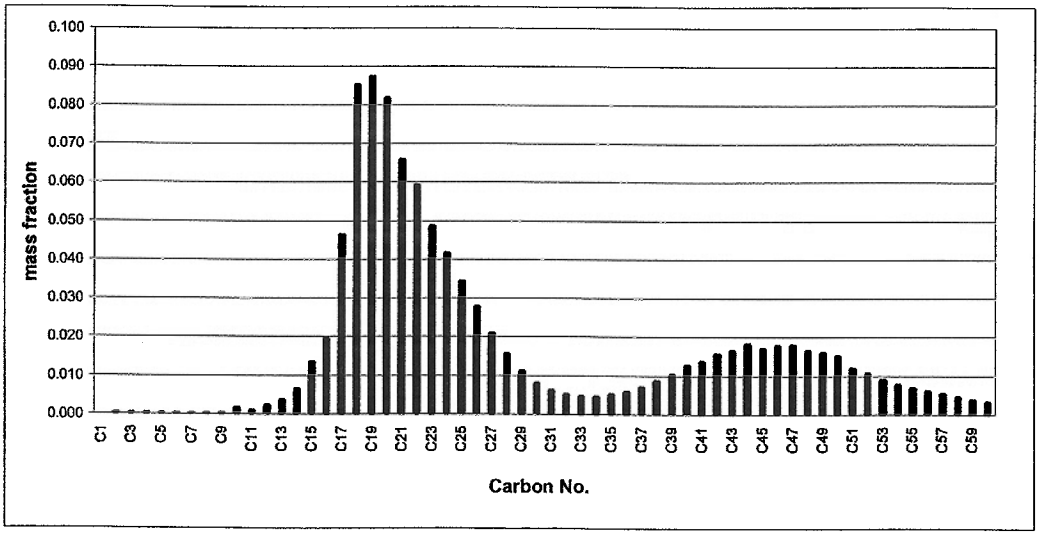
Adapted from: Drews, A.W.,ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

C1-C60 HISTOGRAM

CLIENT SAMPLE ID ROBERTS BAY ET-01 ROBERTS BAY
ETL SAMPLE ID L309982-22

Carbon No.	mass fr.	Carbon No.	mass fr.	Carbon No.	mass fr.	Carbon No.	mass fr.
C1	0.000	C16	0.020	C31	0.006	C46	0.018
C2	0.001	C17	0.047	C32	0.005	C47	0.018
C3	0.000	C18	0.085	C33	0.005	C48	0.017
C4	0.000	C19	0.088	C34	0.005	C49	0.016
C5	0.000	C20	0.082	C35	0.005	C50	0.015
C6	0.000	C21	0.066	C36	0.006	C51	0.012
C7	0.000	C22	0.059	C37	0.007	C52	0.011
C8	0.000	C23	0.049	C38	0.009	C53	0.009
C9	0.001	C24	0.042	C39	0.011	C54	0.008
C10	0.002	C25	0.035	C40	0.013	C55	0.007
C11	0.001	C26	0.028	C41	0.014	C56	0.006
C12	0.002	C27	0.021	C42	0.016	C57	0.006
C13	0.004	C28	0.016	C43	0.017	C58	0.005
C14	0.007	C29	0.011	C44	0.019	C59	0.004
C15	0.014	C30	0.008	C45	0.017	C60	0.004

Total **1.000**



Duplicate QC

CLIENT SAMPLE ID DUP@L309982-22
ETL SAMPLE ID L309982-22d

Carbon No.	Δ	Carbon No.	Δ	Carbon No.	Δ	Carbon No.	Δ
C1	RPD-NA	C16	0.000	C31	0.000	C46	0.001
C2	RPD-NA	C17	0.001	C32	0.000	C47	0.000
C3	RPD-NA	C18	0.002	C33	0.000	C48	0.000
C4	RPD-NA	C19	0.003	C34	0.000	C49	0.000
C5	RPD-NA	C20	0.002	C35	0.000	C50	0.000
C6	RPD-NA	C21	0.001	C36	0.000	C51	0.000
C7	RPD-NA	C22	0.002	C37	0.000	C52	0.000
C8	RPD-NA	C23	0.001	C38	0.001	C53	0.001
C9	RPD-NA	C24	0.001	C39	0.001	C54	0.001
C10	0.000	C25	0.002	C40	0.001	C55	0.001
C11	0.000	C26	0.001	C41	0.001	C56	0.001
C12	0.000	C27	0.000	C42	0.001	C57	0.001
C13	0.000	C28	0.000	C43	0.001	C58	0.001
C14	0.000	C29	0.000	C44	0.001	C59	0.001
C15	0.000	C30	0.000	C45	0.001	C60	0.001
			Total	**1.000**			

Δ absolute difference. Sample A - Sample B

SRC Group: 2005-7079

SRC ANALYTICAL

422 Downey Road
Saskatoon, Saskatchewan S7N 4N1
(306) 933-6932 1-800-240-8808

Enviro-Test Laboratories
9936-67th Avenue
Edmonton, Alberta T6E 0P5
Attn: Michelle Krukewich

Dec-01-2005

Date Samples Received: Nov-23-2005 Client P.O.: L309982

SAMPLE	CLIENT DESCRIPTION
30128 8/21/2005	L309982-22 ROBERTS BAY ET-01 ROBERTS BAY *OIL*

ANALYTE	UNITS	RESULT
SLOWPOKE		
TOX	ug/g Cl	140

Result is the sum of organic chlorine, bromine and iodine expressed as chlorine.

APPENDIX E

EARTH TECH SPECIAL PROVISIONS

The production and use of this Report is conditional upon the following agreement by the Client and Others who may use or rely upon it.

1. MANDATE OF EARTH TECH

This Report has been prepared pursuant to the instructions of the Client, and is subject to the constraints imposed by those instructions. Earth Tech & Partners Ltd. ("Earth Tech") and the Client are aware of these instructions and constraints. Others, who wish to rely upon this Report in any manner, should inquire of the Client for the terms of Earth Tech's mandate in preparing this Report.

2. BASIS OF REPORT

2.1 Representations to Earth Tech by Client

This Report has been prepared for the specific site, development, design objective, and purpose described to Earth Tech by the Client and is specifically based on all of the aforesaid.

Inaccuracies or alterations, of any of the matters upon which this Report is based, will affect the reliability and applicability of this Report.

2.2 Representations to Earth Tech by Other Persons

Earth Tech may have relied upon the representations or opinions of persons other than the Client in the course of preparing this Report. Earth Tech may not have checked the accuracy of such representations or opinions except where directed to do so by the Client. The accuracy of these representations and opinions will affect the accuracy of this Report.

2.3 Time Sensitivity of Report

The findings expressed in this Report by Earth Tech were valid, in accordance with generally accepted engineering practice and procedures, at the time that they were made. The Client and Others are advised that the conditions upon which such findings were based, and the findings themselves may be subject to change as a result of the passage of time.

3. USE OF REPORT BY THE CLIENT

The Client recognizes that projects involving pollutants and hazardous waste, as defined below, create extraordinary risks. In consideration of the said extraordinary risks and in consideration of Earth Tech providing the services to the Client in connection with the project on which pollutants and hazardous wastes are involved, the Client agrees that Earth Tech's liability to the Client, including liability resulting from claims by Third Parties upon the Client, with respect to any matter in any way arising out of Earth Tech's involvement with pollutants and hazardous wastes associated shall be limited to or otherwise protected as provided in paragraphs (a) and (b) below.

(a) Earth Tech's liability to the Client in connection with pollutants and hazardous waste is absolutely limited, both in contract and in tort for any and all claims arising out of or in connection with the project to a total maximum aggregate amount not to exceed the cost of reperformance of the services at the sole cost of Earth Tech for that portion of the services proven to be in error.

It is further agreed that such limitation shall be exclusive of the liability of Earth Tech to the Client which may otherwise be provided for in this Agreement for claims unrelated to pollutants and hazardous wastes.

In further consideration of Earth Tech providing the services to the Client in connection with the project in which pollutants and hazardous wastes are involved, the Client agrees that in connection with incidents and claims initiated by Third Parties involving pollutants and hazardous wastes, the Client shall indemnify, defend and hold harmless Earth Tech of and from any and all suits, actions, legal and administrative or arbitration proceedings, claims, demands, damages, penalties, fines, losses, costs and expenses of whatsoever kind or character, arising or alleged to arise out of the services of Earth Tech or any claim against Earth Tech arising or alleged to arise from the acts, omissions or work of others. Such indemnification shall apply to the fullest extent permitted by law, regardless of fault or breach of contract by Earth Tech and shall include the fees and charges of lawyers in defending or advising Earth Tech as to such claims under the Agreement.

Without limiting the generality of the foregoing, such indemnity extends to claims which arise out of the actual or threatened dispersal, discharge, escape, release or saturation (whether sudden or gradual) of any pollutant to hazardous waste in or into the atmosphere, or on, on to, upon, in or into the surface or subsurface, soils, water or water courses, persons, objects or any other tangible matter.

(b) Nothing herein shall relieve Earth Tech from their obligations to provide the services required by this Agreement and generally as required by standard engineering practice current as of the date of the performance of the services.

(c) For all purposes of this statement of limitations, "pollutants and hazardous wastes" shall mean any solid, liquid, gaseous or thermal irritant or contaminant, including without limitation smoke, vapour, soot, fumes, acids, alkalis, chemicals and wastes, including without limitation, pollutants, hazardous or special waste as defined in any federal, provincial or municipal laws.

4. SUBCONSULTANTS AND SUBCONTRACTORS

As a result of its mandate, Earth Tech may hire companies or individuals with special expertise or services not available within Earth Tech. These services are for the Client's benefit. The Client agrees to pay for the services of subconsultants and subcontractors. The Client also agrees to indemnify Earth Tech for any damage in any way resulting from the error, omission or negligent act of such subconsultants or subcontractors, including, without limiting the generality of the foregoing, the laboratory testing by subconsultants.

5. JOB SITE SAFETY

Earth Tech is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of Earth Tech personnel on the site shall not be construed in any way to relieve the Client or any other persons on site from their responsibilities for job site safety.

6. HAZARDOUS CONDITIONS AND EMERGENCY PROCEDURE

The Client undertakes to inform Earth Tech of all hazardous conditions, or possible hazardous conditions which are known to it. The Client recognizes that the activities of Earth Tech may uncover previously unknown hazardous materials or conditions and that such a discovery may result in the necessity to undertake emergency procedures to protect Earth Tech employees as well as other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed to. The Client agrees to pay Earth Tech for any expenses incurred as a result of such discoveries and to compensate Earth Tech through payment of additional fees and expenses for time spent by Earth Tech to deal with the consequences of such discoveries.

7. NOTIFICATION OF AUTHORITIES

The Client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that government bodies, and other persons, be informed and the client agrees that notification to such bodies or persons as required may be done by Earth Tech in its reasonably exercised discretion.

8. USE OF REPORT BY OTHERS

Others wishing to rely upon this Report in any manner may do so only upon condition that such use, and the consequences of such use, are entirely at their own risk and that they understand fully the terms of the Mandate and Basis of this Report.

It is further agreed by such Others that Earth Tech will not be liable to them in any manner including any liability in contract or in tort for any damages whatsoever arising from such use.